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Secrecy and Innovation in Tort Law and Regulation

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SECRECY AND INNOVATION IN TORT LAW AND REGULATION

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INTRODUCTION

Secrecy about negative technological impacts is claimed as an entitlement in a variety of situations, though the practice is coming into question.[1] In the environmental arena, where firms claim exemption from disclosure requirements, the law is developing along a fault line that runs between familiar intellectual property and tort categories. The current resolution—simply transplanting traditional trade secrecy practice into the regulatory context—is inadequate.

Knowledge about technological effects, such as pollution, has two separate personae. It may be commercially valuable if its distribution is limited, yet it also may be the key to identifying a disease or ecological harm if it is distributed freely in medical and research settings. The two functions of such data—commercial and scientific—operate in very different frameworks of meaning. A claim of entitlement in one sphere has effects in the other, but the legal language necessary to compare the two has not been developed. This article attempts to outline a basis for understanding the issues by examining trade secrecy in the context of regulation of chemical pollution.[2]

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1. For example, recently jurists and practitioners have criticized the practice of sealing court records and settlement agreements which contain information about hazards to health. *See* Keith Schneider, *Court Rejects U.S. Effort to Keep Exxon Valdez Settlement Agreement Secret*, N.Y. TIMES, Mar. 9, 1991, at p. 9; *Texas High Court Cuts Into Secrecy in Civil Suits*, N.Y. TIMES, Apr. 23, 1990, at A17. On the Texas rules, see Lloyd Doggett, *Keeping Court Records in the Open; Texas Supreme Court Adopts New Rule*, TRIAL, July 1990, at 62. *See* Arthur B. Miller, *Confidentiality, Protective Orders, and Public Access to the Courts*, 105 HARV. L. REV. 427 (1991); Richard L. Marcus, *The Discovery Confidentiality Controversy*, 1991 ILL. L. REV. 457; David Timmins, Note, *Protective Orders in Products Liability Litigation: Striking the Proper Balance*, 48 WASH. & LEE L. REV. 1503 (1991).

2. Commentaries on secrecy and access in the law include: KIM LANE SCHEPPELE, LEGAL SECRETS (1988); David D. Friedman et al., *Some Economics of Trade Secret Law*, 5 J. ECON. PERSP. 61 (Winter 1991); RICHARD A. POSNER, ECONOMIC ANALYSIS OF LAW (1992); RICHARD A. POSNER, THE ECONOMICS OF JUSTICE (1981); Anthony Kronman, *Mistake, Disclosure, Information and the Law of Contracts*, 7 J. LEGAL STUD. 1-34 (1978); SISELLA BOK, SECRETS—ON THE ETHICS OF CONCEALMENT AND REVELATION (1983). Commentaries on the trade secrecy exemption in disclosure laws include: RUSSEL B. STEVENSON, JR., CORPORATIONS AND INFORMATION—SECRECY, ACCESS AND DISCLOSURE (1980); Thomas O. McGarity & Sidney A. Shapiro, *The Trade Secret Status of Health & Safety Testing Information: Reforming Agency Disclosure Policies*, 93 HARV. L. REV. 837 (1980); Elinor P. Schroeder & Sidney A. Shapiro, *Responses to Occupational Disease: The Role of Markets, Regulation, and Information*, 72 GEO. L.J. 1231 (1984). *See also* Gerald Wetlaufer, *Justifying Secrecy: An Objection to the General Deliberative Privilege*, 65 IND. L.J. 845 (1990); Rebecca S. Eisenberg, *Proprietary Rights and the Norms of Science in Biotechnology Research*, 97 YALE L.J.

Secrecy is an ambiguous concept and covers a wide range of behaviors.[3] Legal doctrine usually starts from the position that a privilege of secrecy must be justified,[4] perhaps because information is so flexible and productive.[5] Once it is released, information may travel far and quickly. This characteristic itself may explain our ambivalence about secrecy and the fact that, in practice, the law's treatment of claims to information is somewhat uneven. The legal decisionmaker who is called upon to decide whether a secret shall be revealed is placed in a difficult position; as an outsider one cannot fully appreciate the value of the secret or measure the risks of releasing it. The structure of the situation lends rhetorical power—a "Pandora's Box" effect—to claims of entitlements to secrecy. Courts, agencies, and legislatures may respond to secrecy issues in distinct ways, since secrets and the risks of revealing them will be presented differently in litigation, administrative, and legislative settings. Trade secrecy has one meaning in a common law setting and very different implications when it is grafted onto regulation.

Our particular experience with trade secrecy about chemicals is worth examining closely, as it raises basic issues about participation and expertise which are important in relation to other technical options, such as biotechnology. Proprietary claims to information impose substantial costs on regulation and hinder such significant regulatory initiatives as waste

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177 (1987); Pamela Samuelson, *Information As Property: Do Ruckelshaus & Carpenter Signal a Changing Direction in Intellectual Property Law?* 38 CATH. U. L. REV. 365 (1989); P.D. Finn, *Confidentiality & the "Public Interest,"* 58 AUSTL. L.J. 497 (1984); R. Grant Hammond, *Quantum Physics, Econometric Models & Property Rights to Information*, 27 REVUE DE DROIT DE MCGILL 47 (1981).

3. If information is thought of as an economic good, secrecy can be seen as an exercise of control over information, much like an owner's control over any property. I will speak of secrecy primarily in these terms. Bok also focuses on behavior and identifies hiding as the defining characteristic of secrecy. BOK, *supra* note 2, at 5-6. Tefft treats the option of secretive behavior as a resource: "a social resource (or adaptive strategy) used by individuals, groups and organizations to attain certain ends in the course of social interaction." STANTON K. TEFFT, SECRECY, DISCLOSURE AND SOCIAL THEORY 35 (1980) (describing different concepts of secrecy.) Scheppele discusses secrecy itself as an object, a piece of information which is withheld or a property of that information. *See infra* section III.

4. *See* Wetlaufer, *supra* note 2, at 883-90. Wetlaufer relates the legal presumption against the legitimacy of secrets to several general characteristics of secrecy: first, information is power; second, people and organizations systematically seek, as a matter of self-interest, to keep secrets; third, there is a strong association between secrecy and bad acts, as bad acts always seek out secrecy; fourth, secrecy operates to alienate or create distance between the secret keeper and the one from whom the secret is kept.

5. Information is productive, but measures of social welfare commonly show large discrepancies between private and social gains from knowledge production, suggesting a role for public encouragement of information production. Some characteristics of information make it problematic as a subject of legal rules. It is difficult to evaluate until it is possessed and it is easily transferred, so that control is difficult. Kenneth Arrow, *Economic Welfare & the Allocation of Resources for Invention*, *in* THE RATE DIRECTION OF INVENTIVE ACTIVITY 604 (1982). Deception and manipulation are easy to engage in and hard to check. A. MICHAEL SPENCE, MARKET SIGNALLING: INFORMATION TRANSFER IN HIRING AND RELEASED SCREENING 143 (1974). Asymmetries of information access affect behavior and transactions. George A. Akerlof, *The Market for "Lemons": Quality Uncertainty and the Market Mechanism*, 84 Q.J. ECON. 488 (1970); JOHN W. PRATT & RICHARD ZECKHAUSER, PRINCIPALS & AGENTS—THE STRUCTURE OF BUSINESS (1985).

reduction.[6] Secrecy may also be an important factor in legislative attempts to craft market-based pollution control strategies.[7] Legal entitlements to control information about exposure to pollution also affect the development of the health sciences concerned with technological impacts and restrict individuals' access to medical care.

The article begins in section I by describing trade secret law and its economic underpinnings. The strongest general argument for legal protection of trade secrecy is the claim that it plays an important role in the intellectual property system and thus functions to encourage useful innovation. Although this claim is routinely relied upon in legal commentary,[8] economic analysis suggests that it may be overdrawn. The practical usefulness of trade secrecy and its social benefits vary in different technological and competitive settings. The common law protecting trade secrets reflects this variability. Far from a firm entitlement in the nature of property, trade secrecy is a flexible device, but one which is limited to specific uses in the context of commercial rivalry. Trade secret law does not purport to give trade secret claimants an entitlement to withhold exposure information. Nor does the economic rationale for trade secret law suggest that such an entitlement would be appropriate.

Section II describes the current regulatory law on disclosure in food and drug, environmental, and occupational health law, and explores the costs of the current compromise between access and secrecy. The costs of allowing broad secrecy privileges in the regulatory context range from the loss of individual medical opportunities to unknown but perhaps substantial effects on the future development of technology and regulation. Section II also explores the way in which courts and agencies respond differently to secrecy claims. Courts appear to be more comfortable with disclosure of exposure data, perhaps because they are positioned more favorably to assess the merits of individual secrecy claims.

Section III discusses the jurisprudence of information entitlements. Standard justifications for property entitlements and related theoretical treatments of privacy and of liability compel the conclusion that health and environmental disclosure interests generally trump commercial secrecy.

Section IV explores the options available to replace or supplement the current law. It suggests that alternative protections for valuable information can be framed. Trade secrecy is one of an array of devices for

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6. Regulators face a range of difficulties in generating information and assessing the accuracy and usefulness of data submitted by companies. Confidentiality claims complicate the process. *See, e.g.*, Keith Schneider, *F.D.A. Defends Milk-Producing Drug in Study*, N.Y. TIMES, Aug. 24, 1990, at A18 (with manufacturer's permission, agency released safety studies on bovine growth hormone to respond to public criticism on adequacy of agency safety review); Gina Kolata, *Patients and Scientists Fight for Control of Medical Information*, N.Y. TIMES, Dec. 2, 1990, at E4 (federal officials are under pressure to release research results for treatment before publication of scientists' findings); Barnaby J. Feder, *Beyond White Rats and Rabbits*, N.Y. TIMES, Feb. 28, 1988, at E1 (new study techniques reduce the number of animals needed to test products; firm rivalry hinders sharing of data, requiring use of more animals for testing); *see* discussion in section II *infra*.

7. See *infra* section II.

8. *See, e.g.*, Miller, *supra* note 1, at 467-77.

securing returns on research investment, and the usefulness of each method varies according to its context. Foreclosing trade secret claims to pollution or health effects information would shift reliance toward other devices. The nature of the technologies of most immediate concern for management of environmental quality—applied chemistry and biology—provide opportunities for better protection of trade secrets through a specialized registration or patent system. Rethinking the scope and format of intellectual property protection also points to some new possibilities for environmental regulation, such as environmental patents to encourage research on less polluting technologies.

I. TRADE SECRET LAW

The common law of trade secrecy has a varied history and texture.[9] Courts have had difficulty gaining purchase on a core legal theory to support claims for relief. They have drawn on contract law,[10] tort law,[11] equity principles,[12] and property law.[13] Section 757 of the Restatement

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9. Trade secret law dates from the first half of the nineteenth century. In 1820, an English Court of Chancery granted an injunction against the use or disclosure of a trade secret because it was obtained by the defendant through a breach of trust and confidence. Yovatt v. Winyad, 37 Eng. Rep. 425, 426 (Ch. 1820); *see also* Green v. Folgham, 57 Eng. Rep. 159 (Ch. 1823). Early cases in the United States were Vickery v. Welch, 36 Mass. 523 (1837), and Peabody v. Norfolk, 98 Mass. 452 (1868). *See* M.F. JAGER, TRADE SECRETS LAW 1-6 (1987).

The law has been partially codified. The Uniform Trade Secrets Act ("UTSA") has become law in twenty-one states; several states have enacted variations. It has modified the common law in several respects, mostly to strengthen the trade secret claimant's hand. The most important application of the Act is in criminal cases.

10. Morrison v. Moat, 68 Eng. Rep. 492 (1851) (secret medicine). Courts have invoked contract principles where an express licensing or confidentiality agreement has existed. The implied contract and tort approaches are theoretically different, but require the same elements. MICHAEL EPSTEIN, MODERN INTELLECTUAL PROPERTY LAW 32-33 (1985); *see, e.g.*, Speedry Chem. Prod., Inc. v. Carter's Ink, 306 F.2d 328, 331 (2d Cir. 1962) (providing list of elements under tort approach); Newell v. O. A. Newton & Son Co., 104 F. Supp. 162, 165 (D. Del. 1952) (providing list of elements under contract approach).

11. Trade secret law establishes the basic rules of fair play in competition; its goal is to maintain commercial morality—honest, good faith business dealings. Unfair trade laws, part of tort law, are a root. RIDSDALE ELLIS, TRADE SECRETS, 2-4 (1953); POSNER, *supra* note 2.

Most early cases were couched in tort law concepts, that is, the relief granted was termed punishment for breach of confidence by the trade secret misappropriator. *See, e.g.*, Eastman Co. v. Reichenbach, 47 N.Y. 435 (1892), *aff'd*, 29 N.Y.S. 1143 (1894) (court enjoined the plaintiff's former employees, now competitors, from using trade secrets). The Eastman court found that the former employees' act was "not legitimate competition, which it is always the policy of the law to foster and encourage, but it is *contra bonos mores*, and constitutes a breach of trust which a court of law, much less a court of equity, should not tolerate." *Id.* at 441.

The tort theory was incorporated into section 757 of the RESTATEMENT OF TORTS (1939). Section 757 provides that one who uses or discloses another's trade secret is liable if the disclosure or use "constitutes a breach of confidence reposed in him by the other in disclosing the secret to him." RESTATEMENT OF TORTS § 757 (1939). Most states have adopted breach of confidence as the basis for trade secret protection. *See, e.g.*, Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 481-82 (1974).

12. *See generally* ELLIS, *supra* note 11. Trade secrets also have been protected under the doctrine of unjust enrichment, rooted in concepts of "natural justice.".

13. *See infra* notes 29-33 and accompanying text and sections II, III; *see also* Conmar Prods. Corp. v. Universal Slide Fastener, 172 F.2d 150, 155 (2d Cir. 1949) (courts speak of trade secrets as "property"); Electro-Craft Corp. v. Controlled Motion, Inc., 332 N.W.2d 890 (Minn. 1983) (applying the UTSA yet focusing on "property rights").

of Torts, which maintains that "an exact definition of a trade secret is not possible," is the primary doctrinal resource on the topic. It declares that trade secret information may be a formula or pattern or any information which furnishes a competitive advantage.[14]

It is secrecy itself which is the key formal characteristic,[15] rather than the novelty or quality of the information.[16] Secrecy, as a term of art, does not have the lay meaning, "revealed to none or to few."[17] To qualify for protection, the information must be "substantially secret,"[18] but the courts often relax the secrecy requirement and emphasize the competitive advantage element. Generally, a trade secret claimant need only show that the matter has not been generally disclosed.[19] Some rulings

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14. RESTATEMENT OF TORTS § 757, cmt. b (1939) [hereinafter RESTATEMENT § 757, cmt. b]:
> 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 obtain an advantage over competitors who do not know or use it. It may be a formula for a chemical compound, a process of manufacturing, treating or preserving materials, a pattern for a machine or other device, or a list of customers.

15. RESTATEMENT § 757, cmt. b, *supra* note 14; *see also* Microbiological Research Corp. v. Muna, 625 P.2d 690, 696 (Utah 1981). Courts have upheld claims without evidence of the use of competitive advantage. *See* Syntex Opthalmics, Inc. v. Tsuetake, 701 F.2d 677 (7th Cir. 1983); Affiliated Hosp. Prods., Inc. v. Baldwin, 373 N.E.2d 1000 (Ill. App. Ct. 1978). Proof of secrecy, however, is always an element. At times, there is little discussion of use and competitive advantage. A claimant who takes steps to maintain secrecy is deemed to have established these elements; actual use may be the placeholder for value. *Syntex Opthalmics*, 701 F.2d at 683; Reinforced Molding Corp. v. General Elec. Co., 592 F. Supp. 1083, 1087 (W.D. Pa. 1984); Gillette Co. v. Williams, 360 F. Supp. 1171, 1173 (D. Conn. 1973) (need not even be of value).

UTSA does not specify, however, that the subject of the claim must be a secret; rather UTSA provides that it must "derive independent economic value from not being generally known . . . ." Independent economic value is not defined. Minnesota has construed this to carry forward the common law requirement of a "competitive advantage." *Electro-Craft Corp.*, 332 N.W.2d at 898-99.

16. Jurisdictions differ on whether trade secrets must be significant or novel. *See* Bromhall v. Rorvik, 478 F. Supp. 361, 366-68 (E.D. Pa. 1979) (must be novel); International Indus., Inc. v. Warren Petroleum Corp., 99 F. Supp. 907, 914 (D. Del. 1951), *cert. dismissed*, 355 U.S. 943 (1958); Structural Dynamics Research Corp. v. Engineering Mechanics Research Corp., 401 F. Supp. 1102, 1107 (E.D. Mich. 1975); Drill Parts & Serv. Co. v. Joy Manuf. Co., 439 So. 2d 43, 49 (Ala. 1983); Sun Dial Corp. v. Rideout, 108 A.2d 442, 445 (N.J. 1954). According to *Kewanee Oil*, some novelty will be required; that is, it must not be generally known. Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470 (1974).

Kitch has analyzed the value of a novelty-based rule for intellectual property, and its relationship to obviousness, in the context of patent law. Edmund W. Kitch, *Graham v. John Deere, Co.: New Standards for Patents*, 1966 SUP. CT. REV. 293 (1966). The two are distinct, but tend to merge into each other. Courts have been inconsistent on this point.

See Lee v. Samburn, 94 P.2d 153 (Ca. 1952) (if the idea or information is not obvious and has value and would require some substantial expenditure of time, work, or money to arrive at the same result then the information is a trade secret subject to legal protection); A.O. Smith Corp. v. Petroleum Iron Works Co., 73 F.2d 531 (6th Cir. 1934) (trade secrets which involved nothing more than mechanical skill were not subject to legal protection, basing secrecy protection on "paying the price in labor, money or machines expended by the discoverer").

17. WEBSTER'S NEW INTERNATIONAL DICTIONARY 2261 (2d ed. 1938).

18. *See* Financial Programs, Inc. v. Falcon Fin. Servs., Inc., 371 F. Supp. 770, 777 (D. Or. 1974); General Aniline & Film Corp. v. Frantz, 272 N.Y.S.2d 600, 606 (N.Y. Sup. Ct. 1966); Data Gen. Corp. v. Digital Computer Controls, Inc., 357 A.2d 105, 110-11 (Del. Ch. 1975) (where 6000 persons had access to design drawings with legend on them prohibiting use, they were still secrets).

19. *See, e.g.*, Electro-Craft Corp. v. Controlled Motion, Inc., 332 N.W.2d 890, 898-900 (Minn. 1983) (must not be readily ascertainable, but if is ascertainable only at considerable expense, may be protected as trade secret). The Restatement makes the availability, that is, the "ease or difficulty"

support the view that as long as most firms in the industry are not aware of the information, it can still be treated as a trade secret because it gives an advantage over those who do not know it and therefore it is not the "common property" of the industry.[20] Thus, more than one individual or firm may have separate rights in the same 'secret,' and if each has lawfully come into knowledge of it, each may seek legal protection for it, unless one publishes it, as each has a right to do.[21]

At the same time, the scope of the law's protection of any particular item of information is fairly limited. Legitimate means of discovery include reverse engineering, purchase by innocent third parties, and disclosure by one not under an obligation to maintain confidentiality.[22] If the recipient of a secret knows the contents before a disclosure is made in confidence, that person is free to use it.[23] A plaintiff can only prevent use or disclosure by one who obtained the secret by improper means;[24] improper means include obtaining the secret through illegal activities or fraud[25] and by extraordinary measures to overcome precautions intended

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of obtaining information properly, only one of several factors in determining whether or not information is a trade secret. This is consistent with the relative secrecy concept; if the reverse engineering is lengthy and expensive, the person who does it can have a trade secret in the information. *See* JAGER, *supra* note 9, at 5-33.

20. *Electro-Craft*, 332 N.W.2d at 898-900; ELLIS, *supra* note 11, at 34. Issuance of a patent is as against the whole nation; therefore, one needs to show true novelty. However, common law rights cannot be enforced against one who is already lawfully in possession; therefore, novelty is not needed against everyone. A plaintiff need not show that his design is novel to the entire world.

21. *See, e.g.*, Sandlin v. Johnson, 141 F.2d 660, 661 (8th Cir. 1944) (property right in trade secret may be abandoned). This standard is interesting in light of the "common pool" phenomenon identified by economists. It suggests that the law will support or accept the existence of a separate community of interest in new techniques within an industry. See *infra* notes 75-77, 98-105, and accompanying text.

22. Smith v. Chanel, Inc., 402 F.2d 562, 567 (9th Cir. 1968). "Since appellees' perfume was unpatented, appellants had a right to copy it, as appellees concede. There was a strong public interest in their doing so, '[f]or imitation is the life blood of competition.'" *Id.* (quoting American Safety Table Co. v. Schreiber, 269 F.2d 255, 272 (2d Cir. 1959)). In Cheney Bros. v. Doris Silk Corp., 35 F.2d 279 (2d Cir. 1929), *cert. denied*, 281 U.S. 728 (1930), Judge Hand held that fashion designs may be copied. Just because a product is capable of being reverse engineered does not mean there is a right to disclose it. EPSTEIN, *supra* note 10; RESTATEMENT § 757, cmt. b, *supra* note 14. Courts will protect secrets that can be reverse engineered only at considerable expense. *See* Russell v. Wall Wire Prod. Co., 78 N.W.2d 149, 154 (Mich. 1956) ("readily ascertainable"); Electro-Craft Corp. v. Controlled Motion, Inc., 332 N.W.2d 890 (Minn. 1983) ("quickly"); Wilden Pump & Eng'r Co. v. Pressed & Welded Products Co., 199 U.S.P.Q. (BNA) 390 (N.D. Cal 1978) ("readily revealed"); E.I. duPont de Nemours & Co. v. Christopher, 431 F.2d 1012 (5th Cir. 1970), *cert. denied*, 400 U.S. 1024 (1971) (photographs taken in overflight did not qualify as legitimate reverse engineering).

23. Larson v. General Motors Corp., 52 PQ 450, 454 (S.D.N.Y. 1941); De Filippis v. Chrysler Corp., 159 F.2d 478 (2nd Cir.), *cert. denied*, 331 U.S. 848 (1947). The recipient of the secret may have to pay for the use of the secret. ELLIS, *supra* note 11, at 42. The UTSA rejects the Restatement's absolute immunity for all good faith third parties.

24. Forro Precision, Inc. v. IBM Corp., 673 F.2d 1045 (9th Cir. 1982), *cert. denied*, 471 U.S. 1130 (1985); Structural Dynamics Research Corp. v. Engineering Mechanics Research Corp., 401 F. Supp. 1102 (E.D. Mich. 1975).

25. Solo Cup Co. v. Paper Mach. Corp., 240 F. Supp. 126, 137 (E.D. Wis. 1965) (theft), *aff'd in part, rev'd in part*, 359 F.2d 754 (7th Cir. 1966); Seismograph Serv. Corp. v. Offshore Raydist, Inc., 135 F. Supp. 342 (E.D. La. 1955) (defendant feigned interest in joint venture with plaintiff), *aff'd in part, rev'd in part*, 263 F.2d 5 (5th Cir. 1958); Dow Chem. Co. v. United States, 536 F. Supp. 1355 (E.D. Mich. 1982) (aerial photos are improper means of obtaining trade secret), *rev'd*, 749 F.2d 307 (6th Cir.), *aff'd*, 476 U.S. 227 (1986); E.I. duPont de Nemours & Co. v. Christopher, 431 F.2d 1012 (1970), *cert. denied*, 400 U.S. 1024 (1971).

to protect the secrecy.[26] The cases thus emphasize protection against bad behavior and limit legal actions for recovery to defendants who have had notice of the claim.

For the most part, trade secret law does not address nonrivalry interests and, where there is a conflict with other legal values, the confidentiality interest often will be compromised or overridden.[27] This situation arises most frequently with post-employment restrictive covenants, in which the employee agrees not to compete with the employer after the termination of their employment relationship. Courts closely scrutinize these and may treat them as restraints of trade, but standards vary from state to state.[28]

While most of the case law treats liability as resting on an affirmative duty not to disclose,[29] property theories have recently received increased

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26. EPSTEIN, *supra* note 10, at 48.

27. Litigants may discover trade secrets where necessary to pursue a cause of action. *See, e.g.*, Fibron Products, Inc. v. Hooker Chemical Corp., 206 N.Y.S.2d 659 (1960). There is also tension between the unfair competition goals of trade secrecy and antitrust laws. *See* Miller, *supra* note 1; Marcus, *supra* note 1; Timmins, *supra* note 1; W. C. HOLMES, INTELLECTUAL PROPERTY & ANTITRUST LAW (1991).

28. *See, e.g.* Allis-Chalmers Mfg. Co. v. Continental Aviation Eng'r Corp. 255 F. Supp. 645 (E.D. Mich. 1966) (balancing interests); Dunn v. Frank Miller Assoc., Inc., 227 S.E.2d 243, 244 (Ga. 1976); Mutual Loan Co. v. Pierce, 65 N.W.2d 405, 407 (Iowa 1954); Arthur Murray Dance Studios v. Witter, 105 N.E.2d 685, 693 (Ohio 1953). Courts have been troubled by limitations on employees' mobility and on the use of their own expertise. Employers may require employees to agree not to work for competitors and may have implied agreements to this effect, but where a contract limiting employment with competitors would result in oppressive limitations on employees' ability to find work, courts often will not uphold the limit. *See, e.g.*, Disher v. Fulgoni, 464 N.E.2d 639 (Ill. App. Ct. 1984) (overbroad restrictive covenant violated public policy as it restricted flow of information necessary for competition among businesses and imposed undue hardship on employees). In general, a restrictive covenant must protect a legitimate interest of the employer. Water Servs., Inc. v. Tesco Chems., 410 F.2d 163, 167 (5th Cir. 1969). A restrictive covenant should also be reasonable as to geographic and temporal scope. National Chemsearch Corp. v. Hanker, 309 F. Supp. 1278, 1280 (D.D.C. 1970); Novelty Bias Binding Co. v. Shervin, 175 N.E.2d 374, 376-77 (Mass. 1961); Technicolor, Inc. v. Traeger, 551 P.2d 163, 169 (Haw. 1976); State Medical Oxygen & Supply Inc. v. American Medical Oxygen Co., 782 P.2d 1272 (Mont. 1989). Whether the courts may void or modify restrictive covenants depends on the jurisdiction and on the factual circumstances. Unless there is new consideration for an added restrictive covenant, it may be voidable. Gagliardi Bros., Inc. v. Caputo, 538 F. Supp. 525, 528 (E.D. Pa. 1982); Maintenance Specialties, Inc. v. Gottus, 314 A.2d 279, 281 (Pa. 1974).

The Illinois Trade Secrets Act expressly overrules the Illinois line of cases limiting confidentiality provisions in employment contracts to reasonable time and territory. ILL. STAT. ANN. ch. 140, para. 351 (Smith-Hurd 1992). *See, e.g.*, Disher v. Fulgoni, 464 N.E.2d 639 (Ill. App. 1984); Cincinnati Tool Steel Co. v. Breed, 482 N.E.2d 170 (Ill. App. 1984). These cases were unique and the Illinois statute returns that state to the mainstream. JAGER, *supra* note 9. *But see* Kitch, *infra* note 36, at 683 (disapproving).

Six states have enacted statutes which render post-employment restrictive covenants void as against public policy. EPSTEIN, *supra* note 10, at 180. *See* Suellen Lowry, *Inevitable Disclosure of Trade Secret Disputes: Dissolution of Concurrent Property Interests*, 40 STAN. L. REV. 519 (1988); Stephen J. Davidson & Robert L. Demay, *Application of Trade Secret Laws to New Technology—Unwinding the Tangled Web*, 12 WM. MITCHELL L. REV. 579 (1986); Bruce Allen Kugler, note, *Limiting Trade Secret Protection*, 22 VAL. U. L. REV. 725 (1988).

29. *See* Shatterproof Glass Corp. v. Libbey-Owens Ford Co., 758 F.2d 613 (Fed. Cir.), *cert. denied*, 474 U.S. 976 (1985); Chicago Lock Co. v. Fanberg, 676 F.2d 400, 404 (9th Cir. 1982); Cotson Co. v. Wittel, No. 4-90-0552 (Ill. App. Ct. filed Mar. 21, 1991). A trade secret claimant may protect his secrets from unauthorized disclosure or use by a third party (not a party to a contract with him) only when the third party has notice that the information is considered to be a trade secret and the information was disclosed to the third party through a breach of duty either

attention.[30] Courts may use the term 'property' when describing a trade secret claim. At the same time, they may discuss whether or not such interests can appropriately be considered property and often end by defining the cause of action as one in tort or by limiting the property right to a relational base, that is, as against any who have acquired the property in bad faith or through a breach of trust.[31] The Supreme Court's decision in *Ruckelshaus v. Monsanto*[32] is sometimes cited as authority for the proposition that trade secrets generally are "property," but that decision, discussed below in sections II and III, stops well short of such a holding.[33]

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arising by virtue of a contract or a special relationship. *See* Anaconda Co. v. Metric Tool & Die Co., 485 F. Supp. 410, 424-25 (E.D. Pa. 1980); A. H. Emery Co. v. Marcan Prods. Corp., 268 F. Supp. 289, 299 (S.D.N.Y. 1967), *aff'd*, 389 F.2d 11 (2d Cir.), *cert. denied*, 393 U.S. 835 (1968).

30. *See, e.g.*, ROGER M. MILGRIM, MILGRIM ON TRADE SECRETS (1992); *cf.* Pamela Samuelson, *Information as Property: Do Ruckelshaus and Carpenter Signal A Changing Direction in Intellectual Property Law?*, 38 CATH. U. L. REV. 365, 374 n.52 (1989). Waldron notes that since the protection given by courts to property is much stronger than that given to most personal rights, there is constant pressure to expand the scope of property. Jeremy Waldron, *What Is Private Property?*, 5 OXFORD J. LEG. STUD. 313, 323; *see infra* section IV; *see also* JENNIFER NEDELSKY, PRIVATE PROPERTY AND THE LIMITS OF AMERICAN CONSTITUTIONALISM (1990).

The Restatement seems explicitly to reject the property approach at two points. RESTATEMENT OF TORTS § 757 cmt. a, illus. 6 (1939).

Since 1960 twenty-three states have codified the property notion in criminal statutes. Most courts, however, require that they be embodied in tangible physical form. EPSTEIN, *supra* note 10, at 62-64 and app. E (some states require tangible form, others do not).

Criminal statutes generally protect only against intentional misappropriation. A number of states have recently enacted criminal statutes specifically designed to protect computer software. EPSTEIN, *supra* note 10, at 21.

31. *See, e.g.*, Allen-Qualley Co. v. Shellmar Products Co., 31 F.2d 293, 296 (N.D. Ill. 1929), *aff'd*, 36 F.2d 623 (7th Cir. 1929); Hamilton Nat'l Bank v. Belt, 210 F.2d 706, 708-09 (D.C. Cir. 1953); Vantage Point, Inc. v. Parker Bros., Inc., 529 F. Supp. 1204, 1216 (E.D.N.Y. 1981), *aff'd*, 697 F.2d 301 (2d Cir. 1982).

Trade secrets have several basic features of property. They are assignable, taxable, can form the *res* of a trust and pass to the trustee in bankruptcy. Unlike most property, however, anyone who acquires a trade secret by honest means is free to use it. Junker v. Plummer, 67 N.E.2d 667 (Mass. 1946). Trade secrets are not given the same protection as patents. *Junker*, 67 N.E.2d at 670; Kewanee Oil Co. v. Bicron, 416 U.S. 470, 476 (1974); Minnesota Mining & Mfg. v. Technical Tape, 192 N.Y.S.2d 102 (1959), *aff'd*, 226 N.Y.S.2d 1021 (1962).

The property approach is sometimes used to avoid contract or tort statutes of limitations. Sachs v. Cluett, Peabody & Co., Inc., 31 N.Y.S.2d 718 (1941), *rev'd*, 39 N.Y.S.2d 853 (N.Y. App. 1943), *aff'd*, 291 N.Y. 772 (1944).

The pitfall of property theory is that since it is not a very good fit, some have argued that if it is not property, it is not anything courts can protect. Justice Holmes, in DuPont Powder Co. v. Masland, 244 U.S. 100 (1917), stated that "The property may be denied, but the confidence cannot be. Therefore the starting point for the present matter is not property or due process of law, but that the defendant stood in confidential relations with the plaintiffs, or one of them." *Id.* at 102; *see also* International Inds., Inc. v. Warren Petroleum Corp., 99 F. Supp. 907, (D. Del. 1951) (holding that "relationship of confidence may arise by operation of law"), *aff'd*, 248 F.2d 696 (3d Cir. 1957), *cert. dismissed*, 355 U.S. 943 (1958).

32. 467 U.S. 986 (1984). The Supreme Court held that to the extent a trade secret interest in health and safety information is protected by state law, it is protected by the Fifth Amendment; where a federal statute creates a "reasonable investment-backed expectation" of protection of property interests in data, disclosure of the data constitutes a taking. *See* Samuelson, *supra* note 30.

33. *See, e.g.*, MILGRIM, *supra* note 30; Miller, *supra* note 1, at 467-77. Samuelson suggests that the Court's finding that trade secrets were property at state law was based on a superficial reading of the Missouri cases. *See also* Carpenter v. United States, 484 U.S. 19 (1987) (confidential content of journal's column was "property" within the meaning of mail and wire fraud statutes).

The burden of proof in litigation is, of course, on the trade secret claimant. The plaintiff's usual problems are exacerbated by the nature of secrecy itself: a plaintiff must not only prove a negative—that information is not known by the industry—but also that it is valuable, even though the plaintiff has made every effort to hide even the existence of the information. Courts have relied primarily on evidence of the plaintiff's efforts to keep the secret, particularly on physical symbols of such efforts.[34] Litigating a claim requires evidence of what the secret is,[35] including disclosure in camera.[36] The vindication process thus puts the entitlement at risk, if the defendant does not in fact already have the information. A plaintiff can safely litigate only when he is confident that the defendant already has the information; he therefore needs to acquire information about rivals' activities.[37] Because some level of uncertainty about the actual state of affairs is always present in a situation involving secrets, choices about how to proceed will entail extra costs and risks. One positive result of litigation may be the revelation that what the plaintiff thought was an exclusive possession is widely practiced in the industry, eliminating some costs of guarding the information.[38]

Trade secret law provides firms with certain advantages. Unlike patent law, its administration is decentralized and flexible, which may be useful

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34. Excelsior Steel Furnace Co. v. Williamson Heater Co., 86 F.2d 131 (6th Cir. 1923) (machines which were open to view were not secrets); Sandlin v. Johnson, 57 F. Supp. 374 (W.D. Mo. 1944) (behavior inconsistent with secrecy), *aff'd*, 152 F.2d 8 (8th Cir. 1945); Dow Chemical Mfg. Co. v. American Bromine Co., 177 N.W. 996 (Mich. 1920) (precautions were actually for danger, not secrecy); Hamilton Mfg. Co. v. Tubbs Mfg. Co., 216 F. 401 (W.D. Mich. 1908) (precautions were for danger, not secrecy).

The plaintiff always must show that he has taken steps to maintain secrecy. EPSTEIN, *supra* note 10, at 15; Jet Spray Cooler, Inc. v. Crampton, 282 N.E.2d 921, 925 (Mass. 1972); Healy & Son, Inc. v. Murphy & Son, Inc., 260 N.E.2d 723 (Mass. 1970) (must constantly admonish employees, etc.). If too many employees know it or have access to it, then it is not a trade secret. Wilson Certified Foods, Inc. v. Fairbury Food Prod., Inc., 370 F. Supp. 1081, 1085 (D. Neb. 1974); Lowndes Prod. Inc. v. Brower, 191 S.E.2d 761, 766 (S.C. 1972).

As to nonemployees, disclosure must be subject to a nondisclosure agreement. Data Gen. Corp. v. Digital Computer Controls, Inc., 357 A.2d 105, 108 (Del. Ct. of Chancery 1975) (6,000 had access to plaintiff's drawings, but under agreement); Plastic E. Metal Fabricators, Inc. v. Roy, 303 A.2d 725, 731 (Conn. 1972) (inspection by public official does not affect secrecy status). Publication of picture of machine in annual report evidences lack of secretive intent. Wheelagrator Corp. v. Fogle, 317 F. Supp. 633, 638 (W.D. La. 1970), *aff'd*, 438 F.2d 1226 (5th Cir. 1971).

35. *See* John T. Lloyd Lab., Inc. v. Lloyd Bros. Pharmacists, Inc., 131 F.2d 703 (6th Cir. 1942); Coca-Cola Co. v. Joseph C. Wirthman Drug Co., 48 F.2d 743, 747-48 (8th Cir. 1931); Herold v. Herold China & Pottery, 257 F. 911, 914 (6th Cir. 1919).

36. Defendant's secrets must also be safeguarded by the process. Grasselli Chem. Co. v. National Aniline & Chem. Co., 282 F. 379, 381 (D.C. Cir. 1920) (defendant must disclose its processes if necessary to adjudicate). The possibility of fishing expeditions is recognized in Bead Chain Manufacturing Co. v. Smith, 62 A.2d 215 (N.J. 1948).

The refinement of "eyes only to attorneys" discovery orders may not be worth banking on. *See* Edmund W. Kitch, *The Law and Economics of Rights in Valuable Information*, 9 J. LEG. STUD. 683, 689-91 (1980) (small number of criminal prosecutions for misappropriation under recently passed statutes may be due to risks of further disclosure).

37. Trade secret litigation is more likely to yield results for plaintiffs than is patent litigation. Trade secret plaintiffs win half the time while patent plaintiffs win 20-30% of the time. *See* STEVENSON, *supra* note 2, at 21.

38. STEVENSON, *supra* note 2, at 23-24. Most expenditures, however, are applicable to other information.

with rapidly developing technologies.[39] It is perpetual, as long as secrecy is maintained. However, trade secrets are volatile and may require costly vigilance to protect them from disclosure,[40] including restrictions on employees and the employment relationship.[41] Contracting with other firms to use trade secret information may be risky and awkward. The person who has the idea runs a risk in disclosing it, as disclosure imperils its value. Disclosure under a mere obligation of confidence creates risks for those who receive information, since the obligation must be assumed before the information is revealed. If the information is the same or similar to information already in the receiver's possession, an agreement may prevent full use of it. Large firms are reluctant to accept ideas from outside volunteers and require submitters to sign contracts which severely limit their rights.[42] Indeed, espionage may be a preferable way of acquiring information. In any event, secretive behavior and industrial espionage are a substantial phenomenon related to trade secrecy.[43]

Trade secret doctrine thus operates in the context of commercial rivalry for control of technology and information about it. Legal protection for secrets facilitates fair dealing in the context of duties based upon contracts and confidential relationships.[44] The law seeks to provide some support for the integrity of transactions concerning technical information and to encourage its use to develop and improve technologies. The common law relies on interested rivals to administer the system. On the surface this seems to be less costly than the patent system. Trade secret law, however, requires private expenditures on symbols of security and, implicitly, on espionage and the study of rivals' activities.[45]

Academic commentary on trade secrecy as such has generally focused on two issues: the relationship between patent law and trade secrecy in the innovation process, and the effects of trade secret protection on

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39. JAGER, *supra* note 9, at 1-1.

40. *See* Robert Hershey, *Commercial Intelligence on a Shoestring*, HARV. BUS. REV., Sept.-Oct. 1980, at 28; JAGER, *supra* note 9, at 1-2; Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265 (1977).

41. STEVENSON, *supra* note 2, at 23 (describing some of the costs and overreaction which result from the uncertainty of the situation).

42. Kitch, *supra* note 40, at 277-78.

43. STEVENSON, *supra* note 2, at 7-8. Industrial security is a thriving business including about a half dozen multimillion-dollar companies. In a 1959 survey of Harvard Business Review, 64% of respondents employed by large companies said that their companies maintained some form of organized intelligence system and 18% indicated that their firms had formal departments with trained employees assigned to gather information about their employer's rivals. *See also* TEFFT, *supra* note 3, at 56-57 (citing P.I. SMITH, INDUSTRIAL INTELLIGENCE AND ESPIONAGE (1970)).

44. EJAN MACKAAY, ECONOMICS OF INFORMATION AND LAW (1982). This has a clear efficiency rational separate from encouraging innovation. *Id.*

45. Kitch argues that it may not be wasteful for courts to require plaintiffs to show that they made expenditures to keep information secret, because courts are looking for indications that there is a reasonable probability that the information is in fact secret. He notes, however, that sometimes the best way to keep something secret is to treat it as if it were not valuable. He also suggests that the plaintiff must think it is valuable in order to invest in litigation. However, the litigation may be valuable apart from the secret, which might be disclosed through litigation. Another possibility Kitch notes is that courts look to the investment as a signal to employees that the firm considers the information valuable. Kitch, *supra* note 36, at 698-99.

secretive behavior, which is generally acknowledged to be costly from society's point of view. The two questions are related.

The appropriate relationship of trade secret law to patent and copyright law was the subject of debate for many years.[46] Until the early 1970's, some argued that trade secrecy violated the patent clause of the Constitution, since trade secret law grants indefinite legal protection to a monopoly and does not demand the quid pro quo of publication. Trade secret proponents responded that a right to maintain secrecy is inherent in the act of originating ideas and that patent and trade secret law may be complementary rewards for innovative research. Without the exclusivity achieved through secrecy, a useful product which does not meet the strict standards of the patent law may not be viable.[47] Some kind of legal protection is required to allow limited sharing of this kind of information; otherwise hoarding of information will result.[48]

In *Kewanee Oil Co. v. Bicron Corp.* and *Aronson v. Quick Point Pencil Co.*, the Supreme Court held that trade secret law complements the patent system by encouraging innovation and disclosure, albeit by more limited means than the patent system.[49] It is now settled that secrecy co-exists with patent law as a legitimate option for the firm seeking to protect an investment in information which is also patentable.[50]

Edmund Kitch has suggested, as a rationale for this approach, that trade secrecy reduces the cost of the patent system. While a patent may protect basic concepts, trade secret law can protect less important though valuable information related to patents. Rules that allow patent holders secretly to retain some information assist in patent enforcement, because imitators must contact the patentee for the knowledge.[51] Kitch maintains that most trade secret licensing takes place within a framework of rights established by related patents.[52]

The adequacy of the innovation rationale for trade secrecy protection perhaps depends on what type of information is posited as the subject

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46. *See* Gordon L. Doerfer, *The Limits on Trade Secret Law Imposed by Federal Patent and Antitrust Supremacy*, 80 HARV. L. REV. 1432 (1967).

47. *See* Painton & Co. v. Bourns, Inc., 442 F.2d 216, 225-26 (2nd Cir. 1971).

48. *See* Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470 (1974); Aronson v. Quick Point Pencil Co., 440 U.S. 257, 266 (1979).

49. *See Kewanee Oil Co.*, 416 U.S. 470; *Aronson*, 440 U.S. at 266; *see also* Rochelle C. Dreyfuss, *Dethroning Lear: Licensee Estoppel and the Incentive to Innovate*, 72 VA. L. REV. 677, 683-93 (1986) (*Kewanee* is based upon national policy of protection across full spectrum of inventiveness).

50. American Can Co. v. Mansukhani, 223 U.S.P.Q. (BNA) 97, 107 (7th Cir. 1984); *see also* CVD, Inc. v. Raytheon Co., 227 U.S.P.Q. (BNA) 7 (1st Cir. 1985); College Watercolour Group, Inc. v. Newbauer, 360 A.2d 200 (Pa. 1976); Valco Cincinnati, Inc. v. N & D Machining, Inc., 492 N.E.2d 814, 820 (Ohio 1986); CPG Prods. Corp. v. Mego, 214 U.S.P.Q. (BNA) 206 (S.D. Ohio 1981).

51. Kitch, *supra* note 40, at 288; Dreyfuss, *supra* note 49, at 677; ROBERT M. SHERWOOD, INTELLECTUAL PROPERTY & ECONOMIC DEVELOPMENT 54-61 (1990).

52. *See* Kitch, *supra* note 40, at 278 (citing unpublished work of Steven Cheung and Christopher D. Hall). Cheung agrees and points to the uncertainty of court treatment; indeed, trade secret contracts are filled with hedges. Cheung suggests that the difficulty of contracting concerning trade secrets is evidenced by data showing that the ratio of trade secret licenses to patent licenses is about one to ten. Steven Cheung, *Property Rights in Trade Secrets*, 20 ECON. INQUIRY 40, 44-47 (1982).

of protection. Kitch's view of trade secrecy as a support for the patent system suggests that trade secrets are largely "know-how" (i.e., information about the use of an invention). In comparison, his suggestion elsewhere that trade secret law provides a context for firms to measure their human capital would justify as trade secrets any kind of knowledge. There is little consensus on the type of information which the law ought to cover, though most courts and legal scholars assume that broad coverage is appropriate.

Economists, on the other hand, tend to question the value of legal protection for trade secrets; indeed, many question the value of patents.[53] Economic research on innovation has been concerned largely with identifying the forces that determine the extent of research and development ("R&D") efforts in an industry. Economists have focused on three basic aspects of the problem. One line of research has identified demand (i.e., the extent of the market for real improvements and new products), as a major factor in R&D investment and technological change.[54] Another has emphasized the central role of supply, that is, innovation opportunities in the evolution of particular technologies and the existence of underlying social support for investment, including the state of the sciences, the education system, and financial conditions for investment.[55] The third line of work has investigated appropriability factors affecting a firm's ability to secure returns on its investment in research, focusing on industry structure and market concentration.[56]

Modern intellectual property law has been most influenced by a set of assertions about appropriability and information, articulated in the early 1960's.[57] Kenneth Arrow noted that the spread and re-use of in-

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53. Overviews are given by Sidney G. Winter in OWNING SCIENTIFIC & TECHNICAL INFORMATION 41-60 (Vivian Weil & John W. Snapper eds., 1989) [hereinafter Weil & Snapper] and Steven Cheung, *Property Rights and Invention*, 8 RES. IN L. & ECON. 5 (1986) (with Priest commenting).

54. JACOB SCHMOOKLER, INVENTION AND ECONOMIC GROWTH (1966); *see* PARTHA DASGUPTA & PAUL STONEMAN, ECONOMIC POLICY AND TECHNOLOGICAL PERFORMANCE 7-8 (1987); Morton I. Kamien & Nancy L. Schwartz, *Market Structure, Elasticity of Demand and Incentive to Invent*, 13 J. L. & ECON. 241 (1982); NATHAN ROSENBERG, INSIDE THE BLACK BOX—TECHNOLOGY & ECONOMICS 18 (1982).

55. NATHAN ROSENBERG, PERSPECTIVES IN TECHNOLOGY (1976); *see* DASGUPTA & STONEMAN, *supra* note 54, at 8. Rosenberg suggests that a useful theory of innovation must try to identify the "supply" factors that focus innovative search upon certain solutions and must explicitly consider the institutional structures and dynamics which affect the process of achieving solutions. ROSENBERG, *supra*, at 194-95; *see* DAVID C. MOWERY & NATHAN ROSENBERG, THE INFLUENCE OF MARKET DEMAND UPON INNOVATION: A CRITICAL REVIEW OF SOME RECENT EMPIRICAL STUDIES, *originally published in* RESEARCH POLICY 103-53 (1979). General economic strength—flexibility in economic system, educational quality, rate of investment—is a prerequisite to national capability in high technology industries. Another key is a system of science and technical education that trains well and points a good percentage of graduates toward industrial careers. RICHARD R. NELSON, HIGH TECHNOLOGY POLICIES—A FIVE NATION COMPARISON 4-5, 66-67 (1984); *see also* DAVID C. MOWERY & NATHAN ROSENBERG, TECHNOLOGY AND THE PURSUIT OF ECONOMIC GROWTH 294-95 (1989).

56. Wesley M. Cohen & Richard C. Levin, *Empirical Studies of Innovation & Market Structure*, *in* THE HANDBOOK OF INDUSTRIAL ORGANIZATION, Vol. II 1090-91 (1989).

57. ARROW, *supra* note 5, at 609. Of course, recognition of the appropriability problem predates modern economics. In 1623, the English Parliament passed the Statute of Monopolies to provide adequate incentive for inventive activity. COHEN & LEVIN, *supra* note 56, at 1090-91. Article I, Section 8 of the United States Constitution empowers Congress to grant "for limited times to authors and inventors the exclusive rights to their respective writings and discoveries," in order to "promote the progress of science and useful arts." U.S. CONST. art. 8, § 8.

formation are virtually costless. Information cannot be evaluated until it is known, and cannot be bargained for until its existence is known. The producer of knowledge has little control over its dissemination and thus little ability to recover her investment in it. The limited appropriability of knowledge is exacerbated by the absence of an adequate market for insurance against the risks of research, due to its uncertainty. Thus, not enough information is produced.[58]

This explains in economic terms the basic parable underlying intellectual property law: among rivals in the market place, one is more creative and industrious and produces a good idea, an innovation. If imitation is too easy, the prospects of the new idea may collapse under the weight of its own potential success. Intellectual property law attempts to overcome appropriability difficulties by granting a monopoly as a reward to the first inventor. This slows the process of imitation, increases the costs of copying, and facilitates licensing, so innovators have a chance to recoup their investments.

This basic reward model oversimplifies the situation. Nathan Rosenberg has pointed out that the public image of technology has been built upon the dramatic stories of a small number of major inventions, such as the steam engine, the cotton gin, automobiles, penicillin, radios, and computers. This "heroic theory of invention" has been shaped by popular writers and history textbooks focusing on single sequences of events leading up to the actions of individual inventors. To understand technical change, however, we need to look at the network of relationships in which specific inventions are embedded.[59]

Invention evolves out of an existing stock of knowledge which has concrete spatial and temporal limitations and potential; this context can be thought of as a "topography."[60] In this setting we can see that the complement to appropriability is diffusion, the process of the spread of new technology. Information is extremely flexible, so there are widespread incentives to acquire and build upon it. Indeed, imitation is a common competitive strategy and part of the innovation process. Leading innovative industries produce useful externalities for connected industries. As advances fan out, firms which are well positioned can exploit new information before competitors do.[61] In general, from the point of view of

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58. ARROW, *supra* note 5, at 609.

59. ROSENBERG, *supra* note 54, at 55-56. Individual technological advances seldom stand alone; they almost always connect economically and intellectually to earlier advances and to other related technologies. NELSON, *supra* note 55, at 6. To some extent, the limitations of language itself have also fostered it. The patent law requires that a single name and date be attached to each invention. ROSENBERG, *supra* note 54, at 55-56.

60. RICHARD R. NELSON & SIDNEY G. WINTER, AN EVOLUTIONARY THEORY OF ECONOMIC CHANGE (1982).

61. PAUL STONEMAN, THE ECONOMIC ANALYSIS OF TECHNOLOGY POLICY 51 (1987) [hereinafter STONEMAN (1987)]; PAUL STONEMAN, THE ECONOMIC ANALYSIS OF TECHNOLOGICAL CHANGE 65-67 (1983) [hereinafter STONEMAN (1983)]; *see* NELSON, *supra* note 55, at 2-3. Stoneman describes the literature on diffusion in chapters 5-10 of STONEMAN (1987) and chapters 6-8 of STONEMAN (1983).

Diffusion may gather momentum as the supply of new ideas increases, but in some circumstances it may also lessen appropriability; if a cycle is moving very fast, new technologies may not be

society's interest in maximizing the productivity of information, a good economic case can be made that the earlier that diffusion comes, the better, because information "spillovers" may reduce wasteful duplication of R&D effort.[62] Appropriability protection that is too strong may delay access to innovations by competitors who may contribute important improvements and new technologies.[63] In the last analysis, the economic impact of diffusion may be more important than that of invention.[64]

There is general agreement among economists that secrecy as such is costly. It encourages wasteful duplication and lack of coordination. Folster notes that because of secrecy, the optimal sequence of research is not possible.[65] While some duplication may be inevitable, Steven Cheung and others argue that disclosure through patents mitigates the problems caused by secrecy, primarily because they provide some "observability" of the activities of researchers.[66] Cheung argues that secrecy obstructs the spread of new information and dissipates economic rents to a much greater degree than does the patent system.[67] He identifies four types of losses inherent in secrecy: the cost of industrial espionage, the costs of imitation, the costs of potential litigation, and the costs of unnecessarily delayed research.[68] He also suggests that secrecy options generate distorted research incentives because industrial processes that can be protected by secrecy will be favored over products which are necessarily revealed.[69] This last effect would compound the drag on diffusion that secrecy already creates. A cumulative result may be that technological opportunities are bypassed

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adopted, as firms wait for further improvements. Diffusion may be generally accelerating now with the emergence of a global high technology economy. *See* Simon Ramo, *Globalization of Industry and Implications for the Future*, *in* JANET H. MUROYAMA & H. GUYFORD STEVER, GLOBALIZATION OF TECHNOLOGY—INTERNATIONAL PERSPECTIVES 21-22 (1988).

62. *See* STONEMAN (1987), *supra* note 61, at 102-03.

63. *See* Richard R. Nelson, *Assessing Private Enterprise: An Exegesis of Tangled Doctrine*, 12 BELL J. OF ECON., 93-111 (Spring 1981); WILLIAM D. NORDHAUS, INVENTION, GROWTH, AND WELFARE: A THEORETICAL TREATMENT OF TECHNOLOGICAL CHANGE (1969). The semiconductor industry is an illustration of progress in a cumulative technology that might have been impossible under stronger intellectual property protections. *See* Richard C. Levin, *The Semiconductor Industry*, *in* GOVERNMENT AND TECHNICAL PROGRESS: A CROSS-INDUSTRY ANALYSIS (Richard R. Nelson ed. 1982); DAVID C. MOWERY & NATHAN ROSENBERG, TECHNOLOGY AND THE PURSUIT OF ECONOMIC GROWTH (1989).

64. ROSENBERG, *supra* note 55, at 55-56.

65. STONEMAN (1987), *supra* note 61, at 109-10.

66. Cheung, *supra* note 53. Patents provide visibility and information; patent owners are put in a position to coordinate research. Owners' incentives to invest in development and application are increased. The costs of contracting with other firms to develop the technology are decreased. Kitch, *supra* note 40, at 276-77; *accord* Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COL. L. REV. 839 (1990); *see also* Jay F. Alexander & Mark F. Grady, *Patent Law and Rent Dissipation*, 78 VA. LAW REV. 305 (1991) (discussion of common pool and coordination issues in terms of dissipation of social benefits from R&D investment).

67. Cheung, *supra* note 52, at 41-44. Kitch agrees. He assumes that secrecy cannot be reduced to an insignificant level, absent draconian measures. Kitch, *supra* note 40, at 275. Therefore, any system will have secrecy, though the law might refuse to lend its assistance to the protection of secrecy.

68. Cheung, *supra* note 52, at 47-49; *see* Dreyfuss, *supra* note 49, at 732-36 (recognizing that secrecy prevents the public from scrutinizing harmful effects of inventions).

69. Kitch, *supra* note 36, at 699.

or delayed and that pockets of stagnation develop.[70] "Secrecy and efficient use of knowledge are inimical."[71]

An important function of intellectual property rules is to coordinate research and discourage hoarding and duplication. It is not clear that current legal rules accomplish this. The interplay between market incentives to secrecy and imitation and the established legal formats for appropriability may lead to inefficient results. Economists dispute the usefulness of patents and the type of patent coverage which may be appropriate.[72] Arrow suggested that without the legal protection of patents, the level of investment will always be too low.[73] Others have been concerned, however, that granting monopolies encourages waste.[74] Dasgupta and Stiglitz have argued that with a patent system, overinvestment will occur because if a patent is valuable, research efforts will cluster around the particular research obstacle to obtaining the patent, creating "common pool" inefficiencies.[75] Barzel suggested an analogy to resource depletion; patents may encourage premature research.[76] A related effect may be that patents encourage excessive correlation of the choice of projects for research, while society needs greater diversity.[77]

Kitch has proposed a model of patent law which enriches the simple reward theory and works from an understanding of knowledge as situated in a topography and of the potential for common pool inefficiencies. He suggests that rather than giving rewards for winners in technological races, the patent system functions like the mineral claims system for public lands. It provides the legal setting necessary to allocate resources to the development of a technological "prospect."[78] The patent does

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70. *See* Harvey Brooks, *The Typology of Surprises in Technology, Institutions, and Development*, *in* SUSTAINABLE DEVELOPMENT OF THE BIOSPHERE (William C. Clark & R.E. Munn eds. 1982); *see infra* sections II, III.

71. PARTHA DASGUPTA & PAUL A. DAVID, INFORMATION DISCLOSURE AND THE ECONOMICS OF SCIENCE AND TECHNOLOGY, ARROW AND THE ASCENT OF MODERN ECONOMIC THEORY 530 (1987).

72. Cheung reviews the perspectives on the usefulness of this patent system. Cheung, *supra* note 53; *see also* George L. Priest, *What Economists Can Tell Lawyers About Intellectual Property*, 8 RES. L. & ECON. 19 (1986) (commenting on Cheung and the inconclusiveness of the literature).

73. ARROW, *supra* note 5; *see also* Cheung, *supra* note 53, at 10-12. Arrow did not conclude that patents will correct the problem, but found that direct government investment in research activity is desirable. Jennifer F. Reinganum, *The Timing of Innovation: Research Development and Diffusion*, *in* RICHARD SCHMALENSEE & ROBERT K. WILLIG, HANDBOOK OF INDUSTRIAL ORGANIZATION 904 (1988) (symmetrical models suggest that appropriability is important to overall level of investment; if they are not strong enough, there will be underinvestment in the industry; if they are too strong, there will be overinvestment).

74. *See, e.g.*, Kitch, *supra* note 40, at 278-79. Nelson and Winter agree that several kinds of costs are imposed by patents or secrecy: a) higher average production costs (a gap between best and average practice); b) duplicative or near duplicative R&D efforts (and lower best practice per R&D dollar); and c) possible distortion of the R&D effort, which may be greater or less than it would be in a hypothetical second-best optimum in which other costs are accepted. NELSON & WINTER, *supra* note 60, at 330-33.

75. *See* Partha Dasgupta & Joseph E. Stiglitz, *Industrial Structure and the Nature of Innovative Activity*, 90 ECON. J. 266-93 (1980); *see also* STONEMAN (1987), *supra* note 61, at 80-84, 96.

76. *See* Yoram Barzel, *Optimal Timing of Innovations*, REV. ECON. AND STATISTICS, vol. 50, 348-55 (1968) (describing the "free access" externality); *see also infra* text accompanying note 245.

77. Dasgupta & Stoneman, *supra* note 54.

78. Kitch, *supra* notes 36, 40.

reward the inventor for being first, but also takes care of what happens next, by placing the management of the prospect in the hands of the entity best equipped to handle it and by providing a framework for communication with other firms interested in developing the area.[79] Patents come early in the innovation process and allow firms to signal to each other, reducing the amount of waste. As most patenting probably occurs before development and since most R&D dollars are spent on development, patents may allow much research to be done openly and with efficient sequencing.[80]

Patents thus provide an alternative to costly secretive behavior. Might trade secret law likewise reduce secretive behavior? Richard Posner and others have suggested that the availability of legal protection for misappropriation of secrets reduces the level of guarding behavior, since measures to prevent theft will be less necessary where the courts are available to provide a remedy.[81] This seems logical, but it is difficult to measure how great the benefit is, as secrets are not available for measurement. This difficulty also affects the calculations of firms choosing between patent law and secrecy. One of the chief reasons for choosing secrecy over patent law is that patents are difficult to enforce, because it is hard to monitor what others are doing with your patented information. In some circumstances this uncertainty and the general difficulty of controlling information will cause firms to choose secrecy over disclosure. The availability of legal protection for trade secrets endorses this choice. In addition, courts look to guarding behavior as an index of trade secrecy. It seems likely then that in many circumstances, trade secret law does encourage secretive behavior.[82] The argument that legal protection for secrecy reduces with the costs of secrecy may be true in some situations,[83]

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79. Kitch, *supra* note 36. Kitch builds on Barzel's point that the exploitation of technological information is analogous to fisheries, public roads and oil and water pools, resources which are not subject to exclusive control. Where a rule of first appropriation controls, there is an inefficiently rapid depletion of the resource; it would be more efficient to grant or auction off a monopoly, giving the owner a right to develop the technological opportunity. *See* BARZEL, *supra* note 76.

Information is sometimes thought of as potentially unlimited and since the patent monopoly is a restraint on output, patents have been viewed as a necessary evil and disfavored by the courts. *See, e.g.*, Justin Hughes, *The Philosophy of Intellectual Property*, 77 GEO. L.J. 287 (1988). Kitch argues that the reward theory has influenced the courts to see the problem as a trade-off between the incentive effects and the output constraints of the patent; the courts have tried to weed out patents offering the least net gain, such as trivial inventions enjoying significant commercial advantage. Kitch, *supra* note 40, at 266. Kitch argues that the property rights schools' concerns with scarcity are reflected in the patent system's prospecting function. The novelty test of the patent law places the prospect function where development is taking place, along the frontier of the technology, leaving the older core free for all to use. Kitch, *supra* note 40, at 266, 283-84.

80. Kitch, *supra* note 40; FREDERIC M. SCHERER, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE 410, 412 (2d ed. 1980) (over 75% of R&D dollars are spent on development; the initial innovation is typically inexpensive); STONEMAN (1987), *supra* note 61, at 109-111.

81. *See* POSNER, *supra* note 2, at 40-41; Friedman et al., *supra* note 2. The costs of secretive behavior to prevent accidental loss and reverse engineering are not affected by trade secret rules.

82. Stevenson suggests that the use of trade secrecy is increasing after *Kewanee*. STEVENSON, *supra* note 2, at 21-22. Measurement is difficult, however, as there has been little study. *See* section III(A) *infra*; *see also infra* note 87 (measurement difficulties in researching trade secret use).

83. For instance, in E.I. duPont de Nemours & Co. v. Christopher, 431 F.2d 1012, 1016 (5th

but it does not seem to provide a rationale for trade secret law as a whole.

Businesses apparently do spend large sums protecting confidential information, yet the actual usefulness of trade secret law apparently varies considerably according to context. Empirical data on the use of trade secrecy suggests that firms in many settings find it less helpful than other appropriation strategies. Recent research which focuses on the overall effectiveness of patents suggests that there are striking differences in innovation input and output and in appropriability patterns across different technologies and industries.[84] In some industries, such as chemicals and pharmaceuticals, patents apparently function well.[85] Appropriability also rests on a number of other factors, including gaining lead time, exploiting learning curve advantages, complementary investing in marketing and customer service, and establishing trade names.[86] Firm organization and management characteristics also affect innovation.[87] Firms in most industries use all of these strategies to one degree or another.

A 1987 survey, conducted by Richard Levin et al., examined 650 responses on appropriability conditions in 130 different lines of business. The results are consistent with the findings of other studies on patent effectiveness.[88] For processes, patents were generally rated the least effective mechanism. Lead time and learning curve advantages were rated the highest. Secrecy was considered more effective for processes than patents, but not as effective as lead time and learning curve advantages.[89]

Cir. 1970), the court found that aerial photography of the plaintiff's plant was tortious. A contrary ruling would have required companies to erect a big top over any activity that might reveal valuable data.

84. Industries vary significantly in the rate of patents generated by R&D dollars invested. Cohen & Levin, *supra* note 56, at 1076-77.

85. STONEMAN (1983), *supra* note 61, at 15-17. Other studies have also suggested that in most industries, except in pharmaceuticals; patents are not of vital importance, and that other means of protecting returns are available. *Id.*; STONEMAN (1987), *supra* note 61, at 115-16. "The moral of this evidence is thus that, despite a long-standing concern over the nature and impact of the patent system, the importance of the system, in practical terms, may not be particularly great." STONEMAN (1987), *supra* note 61, at 115.

86. Richard Levin et al., *Appropriating the Returns From Industrial Research and Development*, BROOKINGS PAPERS ON ECON. ACTIVITY 783 (1987). Investments in establishing trade names may be more effective and outlive a patent. *Id.* at 784; Meir Statman, *The Effect of Patent Expiration on the Market Position of Drugs*, *in* DRUGS AND HEALTH: ECONOMIC ISSUES AND POLICY OBJECTIVES 140-51 (Robert B. Helms ed. 1981).

87. One study explored in detail 43 matched pairs of successful and unsuccessful innovations. R. Rothwell et al., *SAPPHO Updated—Project SAPPHO Phase 2*, 3 RESEARCH POLICY 258-91 (1924), *as described in* CHRISTOPHER FREEMAN, THE ECONOMICS OF INDUSTRIAL INNOVATION 107-30 (1982). The project found that the most important determinants of success were close attention to user needs, effective marketing, efficient management of the development process, ability to use outside technology and communicate with the scientific community and project management in the hands of a senior official who could work for the project within the firm.

88. Levin et al., *supra* note 86, at 783-820; *see* WEIL & SNAPPER *supra* note 53, at 45-57; *see also* ROCHELLE DREYFUSS, GENERAL OVERVIEW OF THE INTELLECTUAL PROPERTY SYSTEM 28, 31 (1989) (noting difficulties getting empirical data on intellectual property, especially trade secrecy); ROBERT M. SHERWOOD, INTELLECTUAL PROPERTY AND ECONOMIC DEVELOPMENT 58-59 (1990) (reporting three informal sources which, while less focused, suggest that trade secrecy is viewed by firms as a useful and sometimes very significant protection, particularly with respect to know-how related to patents).

89. Levin et al., *supra* note 86, at 794-95.

For products, patents were generally held to be more effective than for processes, while secrecy was less effective.[90] The data provided some support for the idea that secrecy may be chosen instead of patenting where disclosures in a patent may facilitate inventing around it.[91] Although the appropriability value of a patent may be limited, the cost of patenting is relatively low[92] and patents do tend to raise imitation costs and time.[93] Also, patents have some uses which are not based on appropriability concerns.[94] Generally, participants in the survey considered lead time, learning curves, and sales or service efforts at least as effective as patents or secrecy, and many considered them substantially more effective.[95] While the data suggests that patents and trade secret protection may improve appropriability, they clearly are not the only or even the primary protections.

This research has also thrown light on the appropriate time span for legal protection. Appropriability declines as diffusion takes place and this will vary by industry, technology, and market demand. A five year useful life is a common estimate for trade secrets and patents. The actual time for duplication of a major innovation or a typical patented innovation, however, is usually one to three years.[96] A typical unpatented innovation may be duplicated within six to twelve months.[97]

Interestingly, most of Levin's respondents reported that only three to five firms were capable of duplicating a major process or product innovation and, for a typical process or product innovation, the number was six to ten. The data indicated only a slightly smaller number of duplicators for processes than for products.[98] Thus, for any particular innovation, a relatively small community within an industry may be

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90. *Id.* at 795.

91. *Id.*

92. ERIC VON HIPPEL, SOURCES OF INNOVATION, 51, 56 n.14 (1988) (average patent costs about $5000). For further information see the discussion in chapter 9 of OFFICE OF TECHNOLOGY ASSESSMENT, INTELLECTUAL PROPERTY RIGHTS IN AN AGE OF ELECTRONICS AND INFORMATION (1986).

93. STONEMAN (1987), *supra* note 61, at 114-15. Stoneman notes that in the aircraft industry, lengthening the life of patents would have little effect on incentives, but it would have a greater effect on drugs. *Id.* Levin found that for at least two and as many as fourteen industries, however, patents reduced imitation time; a number of these industries also reported that disclosure of information through patents was a significant drawback. Levin et al., *supra* note 86, at 809.

94. For instance, industry respondents to Levin's study suggested that patents help firms measure the performance of R&D employees; since they work in teams, it is hard to separate their contributions, but the patent application forms provide a rigorous standardized process for doing so. Patents also facilitate access to foreign markets in developing countries, some of which require as a condition of entry that U.S. firms license technology to a host-country firm. Levin et al., *supra* note 86, at 798.

95. *Id.* at 795-97.

96. STONEMAN (1987), *supra* note 61, at 106-07. Stoneman's results suggested that, with a large proportion of patents, imitation occurs through designing around within a short time, usually four years. Nordhaus suggests, however, that the patent system is relatively efficient for small inventions or inelastic demand, generating about 90% of possible increase in welfare. Nordhaus' work suggests that welfare loss for inappropriate life is great after six to ten years. *Id.*

97. Levin et al., *supra* note 86, at 810; Edwin Mansfield, *How Rapidly Does New Industrial Technology Leak Out?*, 34 J. INDUS. ECON. 217-24 (1985). Nelson and Winter assume that firms can imitate. NELSON & WINTER, *supra* note 60, at 335.

98. Levin et al., *supra* note 86, at 812.

directly concerned. This is consistent with the common pool prediction. As firms cluster around the same technological possibilities, it is likely that no more than a handful of firms will work on any one line of inquiry.

A number of studies have identified channels of information diffusion. In Levin's survey, reverse engineering for products, independent R&D, and licensing all rated fairly highly as means of determining a rival's technology. Learning mechanisms relying on interpersonal communication, such as publications, technical meetings, informal conversations, and hiring away employees were strongly correlated. These were not correlated with licensing. Levin suggests that there may be clusters of industries using different types of learning approaches. For new products and processes, the largest group of industries relied on licensing and independent R&D, but there was a second group for which interpersonal contacts were important.[99] Where this is the case, the key to making use of new advances is good information connections.[100] Informal know-how trading appears to be extensive. Firms may go so far as to train rivals' employees.[101]

While conventional analysis suggests that firms should be preoccupied with secrecy and espionage, there also are indications that much information is available through the techniques described in the literature devoted to the subject. Kitch suggests that an undertone of the literature on how to steal your competitor's information is that firms are actually rather careless with information and do not value it greatly. Indeed, the trade press is full of information about new processes; firms regularly hire consultants, looking particularly for experienced consultants who have worked with competitors.[102] Perhaps technical information is not as vulnerable to theft or loss as it first appears.[103]

Some important questions about the role of trade secrets remain, but a clearer picture emerges from these studies. The literature suggests that the structure of each market and the characteristics of each technology establish a unique playing field. The population to which any one trade secret matters often consists of a more or less loosely knit group of firms, working in the same 'vicinity' of the research topography, on related technological projects. Usually a firm's technical advances will shortly become at least partially visible to the other firms; parallel independent research, reverse engineering or changes which are apparent in market performance spread the information, if direct exchange by

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99. *Id.* at 806-07.

100. NELSON & WINTER, *supra* note 60, at 2-3.

101. VON HIPPEL, *supra* note 92, at 76-79.

102. *See* Kitch, *supra* note 36, at 714.

103. Kitch explains the openness he describes as the result of several traits of information. First, complex information is difficult to steal or transmit, it is usually not assembled, and it is embedded in extraneous information. Second, information has a high depreciation rate, unless it is technology or customer relations information; this is the kind of information that courts protect. Third, markets for stolen information are hard to organize. Much value of information is specific in time and place. *Id.* at 711-15.

licensing, barter, or espionage do not.[104] The firms are in touch with each other, whether through formal or informal channels. Each firm has an incentive to control access to information about its activities, in order to maximize its edge over its rivals.[105] The scope of incentives to hide and to learn is much broader than the mere identity of the innovation. Only where there is some tangible benefit to cooperation will a firm disclose any information of value, and it is hard to be sure that information has no value. The strength of legal protection as a factor in innovation may be of minor importance or even irrelevant, as the innovation process is driven primarily by more powerful technological and economic factors, and positive appropriability conditions do not guarantee innovative output. Patent and trade secrecy use may not indicate a need for legal support for appropriability (and thus a role for supplemental trade secret protection), but instead may signal the opportunities provided to some industries by the design of the existing patent system; a different intellectual property scheme might produce different competitive strategies.

Intellectual property law functions as a backdrop for a lively interactive process. Trade secret law is one of the balls in play. A firm's trade secret strategy or claim is alive in its commercial setting. It is created, used and retired according to the logic of the technology which is its subject, as that unfolds in its native market conditions. How is the character of trade secrecy changed when it is transplanted from its common law origins into a regulatory scheme?

II. COMPETING CLAIMS TO TRADE SECRET INFORMATION

Chemical pollution absorbs substantial resources, yet its effects are poorly understood. The market does not produce much information about pollution, because this type of data is both a public good and a negative description of a private good.[106] In the absence of a well-developed information context, the market not only discourages firms from producing data about side effects, but encourages ignorance and deception.[107]

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104. It is hard to document the espionage process, but in the literature one regularly comes across informal remarks about it. *See, e.g.*, Milt Freudenheim, *On Approving Generic Drugs*, N.Y. TIMES, July 9, 1991, at D2. Freudenheim quotes a Mr. Snyder at Biocraft, "There really aren't many secrets in the drug business. As far as manufacturing goes, if there is a secret, somebody will steal it." *Id*; *see* STEVENSON, JR., *supra* note 2.

105. Reinganum, *supra* note 73. Firms need to know how well an innovation is working and what its costs and benefits are turning out to be in other firms. *Id.* The costs and timing of this information will affect the decision to adopt and thus become part of each firm's strategy of learning and secrecy. *Id.*

106. Mary Lyndon, *Information Economics and Chemical Toxicity: Designing Laws to Produce and Use Data*, 87 MICH. L. REV. 1795 (1989). Manufacturing firms do conduct research on the effects of their activities, but it is inadequate. *Id.* This should not be surprising, though a contrary assumption is regularly made. Where effects are dispersed, of complex origin and latent, manufacturers are not situated to study and identify these impacts. Frank Michelman, *Pollution as a Tort: A Non-Accidental Perspective on Calabresi's Costs*, 80 YALE L.J. 647 (1971).

107. There are fairly strong incentives to deceive others about such effects. Research by firms about their own products need not be actively false to be less than adequate. This is a familiar theme in regulation. *See* BOK, *supra* note 2, at 148-50; Richard Peto, *Distorting the Epidemiology*

Yet greater understanding of pollution effects is needed throughout society in medical, legal, and administrative agency practice, in public research, and in the marketplace. Private persons who are interested in it often do not have the financial assets to buy it, nor can they organize; and if it is kept secret, it may not even be visible to prospective purchasers. Our system for studying polluting technologies is rigged together from disparate elements: disclosure rules, manufacturers' studies, and public investments in research. Yet, these sources do not supply a full picture, so that regulators must often do without information. In the context of evolving technologies and choices about the shape of the future, information gaps may have significant opportunity costs.

Knowledge about pollution has some interesting idiosyncracies. It is both concentrated and dispersed and it includes both expert knowledge and lay "local knowledge."[108] Epidemiologists, toxicologists, and ecologists gather and assess data on the dispersed effects of manufacturing technologies. Enriching the data base builds understanding and a broad exchange of information is basic to this process.[109] Two types of local knowledge are prerequisites to expert research. First, description of the pollution, including its identity, amount, and location. Second, description of symptoms or effects which may be associated with an exposure. Information of both types is in short supply.[110] Indeed, the lack of this information (which will be referred to as health or environmental information)[111] is a defining characteristic of contemporary regulation. To the extent local knowledge about pollution is controlled and withdrawn from circulation, research is hindered.

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of Cancer: The Need for a More Balanced View, 384 NATURE 297, 297-300 (1980); ALAN GABBAY, THE CONFIDENTIALITY OF TEST DATA UNDER FIFRA, 2 H.E.L.R. 378, 389-90 (1978); Sidney Shapiro, *Divorcing the Profit Motivation from New Drug Research: A Consideration of Proposals to Provide the FDA With Reliable Test Data*, 1978 DUKE L.J. 155 (1978). Until an information context is developed, making identification and rating of effects less costly, there will be little or no competition in this dimension. Lyndon, *supra* note 106.

108. This is "the knowledge of particular circumstances of time and place." FRIEDRICH A. HAYEK, *The Use of Knowledge in Society*, 35 AM. ECON. REV. 519, 521 (1945).

109. Communication is basic to science, along with some degree of confidentiality to encourage the completion of research. Eisenberg, *supra* note 1; NELSON & WINTER, *supra* note 60, at 391-92. The access problem which is the subject of this article is not access to incomplete research results, but to completed health studies and to raw data on exposures.

As toxicology, epidemiology, and ecology develop, their information needs may diminish. *See* JOHN D. GRAHAM et al., IN SEARCH OF SAFETY 3 (1988) (noting this trend concerning research on the causes of cancer). In the meantime, improvements in the science on cancer seem to demand more, not less, exposure information in cancer risk assessment and in epidemiology. *See* Howard Latin, *Good Science, Bad Regulation, and Toxic Risk Assessment*, 5 YALE J. REG. 89 (1988); Mary Lyndon, *Risk Assessment, Risk Communication and Legitimacy*, 14 COLUM. J. ENVTL. L. 289 (1989).

110. Lyndon, *supra* note 106.

111. The language to describe the information shortfall is undeveloped. The term "trade secret" is easy to use and carries resonances of privacy and property that are meaningful in lay and specialized usage. But the most common regulatory term for the information which I suggest is underproduced (data on negative physical externalities from chemical and related technologies) is HSE data, or is "health, safety and environmental" information. This is both awkward and ambiguous and seems a specialized, even narrow, category. This is a curious inversion since the environment is our context and chemicals are dispersed pervasively in it.

What are the impacts of protecting secrecy in this context? Does the substantive value of the compromise between publication and secrecy, already struck in intellectual property law, change when individual medical choices or the public research agenda are included in the balance?

The transplant of trade secrecy from the common law to regulation also provokes some questions concerning the capacities of the two legal formats. Trade secrecy evolved in the flexible and small scale format of the common law case, in which the court can rely heavily on equitable considerations. A common law court need not articulate a very definite rule and can craft a remedy appropriate to the case at hand. The parties have a rivalry relationship and the court is positioned to acquire a fair degree of understanding of the nature of the individual dispute. Environmental regulation, on the other hand, at least as currently constructed, applies to whole industries, is highly exposed, and generally functions by promulgating broad standards. When regulators work with a concept which has been transplanted from the common law, how do they transform the original principle?

A. Disclosure Law

Conflicts over confidentiality in regulation began to recur in the case law of the late 1970's and early 1980's. The usual statutory mandate for regulatory practice provides that data which firms submit to an agency may be withheld from disclosure to rivals and the public if the data is a trade secret or "confidential."[112] The relationship between such provisions and two other statutes, the Federal Trade Secrets Act ("FTSA")[113] prohibition of disclosure of "proprietary information" by government employees and Exemption 4 of the Freedom of Information Act ("FOIA"),

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112. Environmental provisions include, for example, 42 U.S.C. § 7414 (1988), 40 C.F.R. § 2.301(a)(2) (1991), and 33 U.S.C. § 1318(b) (1988). Early EPA regulations also stipulated that data concerning pollution would not be withheld.

113. 18 U.S.C. § 1905 (1988). The FTSA authorizes criminal penalties for government employees who disclose "proprietary information," unless the disclosure is authorized by law. The statute originated from several nineteenth-century statutes intended to deal with unauthorized disclosure of business information by field agents of the Bureau of Internal Revenue, the Tariff Commission, and the Department of Commerce. The early versions did not focus on trade secrets, but when they were codified in 1948, trade secrets were specifically mentioned as covered material. Chrysler Corp. v. Brown, 441 U.S. 281, 296-301 (setting history); *see* Mark Q. Connelly, *Secrets and Smokescreens: A Legal and Economic Analysis of Government Disclosure of Business Data*, 1981 WIS. L. REV. 207, 236 (1981).

When Chrysler raised the FTSA as authority for preventing the release under the Freedom of Information Act ("FOIA") of data related to affirmative action and employment discrimination, the Supreme Court held that FTSA protection of trade secret information does not prevent an agency from releasing such information. While FOIA itself does not provide the authorization for release which is a defense under the FTSA, agency regulations can provide such authorization. *Chrysler Corp.*, 441 U.S. at 295-96, 302-03, 316-17, 319; *see* General Elec. Co. v. United States Nuclear Regulatory Comm'n, 750 F.2d 1394, 1399 (7th Cir. 1984) (an agency's own rules may not grant the public less access to its records than FOIA would, but can be broader). The courts have generally treated the trade secret coverage of the FTSA and Exemption 4 of FOIA as co-terminous. *Chrysler Corp.*, 441 U.S. at 319 n.49. *But see* General Elec. Co. v. United States Nuclear Regulatory Comm'n, 750 F.2d 1394, 1402 (7th Cir. 1984) (FTSA protects a narrower category of interests, where disclosure "could be devastating to the owners and not just harmful").

which protects "trade secrets and confidential commercial or financial information" from disclosure,[114] was the subject of several early cases.[115]

The disclosure issues were most thoroughly developed in the drug and pesticide contexts, two regulatory schemes which require research by firms. In several FOIA cases that concerned disputes over disclosure of health and safety information that had been submitted to the Food and Drug Administration ("FDA"), the United States Court of Appeals for the District of Columbia articulated a broad disclosure rationale.[116] A separate line of cases addressed the problem in the context of the pesticide regulatory scheme, established by the Federal Insecticide, Fungicide and Rodenticide Act ("FIFRA").[117] The FIFRA cases culminated in the Supreme Court's decision on *Ruckelshaus v. Monsanto*,[118] which acknowledged agencies' broad authority to disclose trade secrets in the course of regulation. This authority has generally not been exercised; agencies have tended to act cautiously, even fearfully, when dealing with proprietary claims to information.

In its early years, the FDA refused to release data that fell within the Restatement's broad definition of trade secrecy. After the enactment of FOIA the FDA changed its policy, and later legislative mandates further encouraged disclosure. Yet, the agency continued to withhold health and safety data claimed as confidential.[119] The United States Court of Appeals

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114. 5 U.S.C. § 552(b), (c) (1988). FOIA directs agencies to release on request any information in their possession, except data which falls within nine exempted categories. The exemptions are to be construed narrowly. Church of Scientology v. United States Dep't of the Army, 611 F.2d 738, 742 (9th Cir. 1979). Exemption 3 covers information "specifically exempted from disclosure by statute." 5 U.S.C. § 552(b)(3). Exemption 4 covers "trade secrets and commercial or financial information obtained from a person and privileged or confidential." *Id.* § 552(b)(4). The Supreme Court has interpreted Exemption 4 to authorize, but not to require, agency withholding of the information. Chrysler Corp. v. Brown, 441 U.S. 281 (1978). The second prong of Exemption 4 hinges on whether the documents are "confidential;" courts ask whether disclosure will (1) impair the government's ability to obtain necessary information in the future or (2) "cause substantial harm to the competitive position" of the submitter. National Parks & Conservation Ass'n v. Morton, 498 F.2d 765, 767 (D.C. Cir. 1974). The agency's determination is reviewed under the "arbitrary or capricious" standard. One factor is whether such information is customarily released to the public. Racal-Milgo Gov. Sys. Inc. v. Small Business Admin., 559 F. Supp. 4, 6 (D.D.C. 1981); AT&T Info. Sys. Inc. v. General Serv. Admin., 627 F. Supp. 1396 (D.D.C. 1986) (bid information). Dicta in *Chrysler Corp.*, however, suggests that the coverage of Exemption 4 and the FTSA are coterminous. *Chrysler Corp.*, 441 U.S. at 319, n.49; *see* Burnside-Ott Aviation Training Center, Inc. v. United States, 617 F. Supp. 279, 285 (S.D. Fla. 1985); Connelly, *supra* note 113 at 221 (discussing controversy over FOIA's authorization of agency discretion on disclosure and explaining the justifications for doing so). Connelly also disputes the allegation that FOIA is commonly used as a tool of industrial espionage. Connelly, *supra* note 113, at 209-10.

115. *See* Connelly, *supra* note 113. These decisions were made against the background of federal statutes containing explicit protections for trade secret information. *Id.* at 243 n.173; Linda B. Samuels, *Protecting Confidential Business Information Supplied to State Governmental: Exempting Trade Secrets From State Open Records Laws*, 27 AM. BUS. L.J. 467 (1989).

116. *See, e.g.*, National Parks & Conservation Ass'n v. Morton, 498 F.2d 765 (1974).

117. 7 U.S.C. § 136 (1988); *see* Mobay Chem. Corp. v. Costle, 518 F. Supp. 254 (W.D. Pa. 1981) (disclosure provisions of FIFRA do not violate Fifth Amendment).

118. 467 U.S. 986 (1984).

119. In 1974, after the passage of FOIA, the FDA reversed its earlier practice of keeping confidential most information submitted to it. The basic policy became one of releasing health and safety information at the time of the product approval. 39 Fed. Reg. 44,602 (1974); 21 C.F.R. § 20.1

for the District of Columbia examined this practice in *Public Citizen Health Research Group v. Food & Drug Administration*,[120] where a consumer advocacy group sought information about ongoing clinical studies of intraocular lenses from the FDA. Noting earlier similar readings of the common law, the court rejected the Restatement definition of trade secrets as "overly broad" and "ill suited for the public law context in which FOIA determinations must be made." It found that the common law intends to protect data which is directly connected to the production process and, therefore, health and safety data are not trade secrets.[121] The court also limited the scope of "confidential commercial or financial information," the second prong of FOIA's Exemption 4, to the common law rule which protects only against harm from a rivals' competitive use of proprietary information. Thus, the agency may not withhold confidential information on the basis that it may be embarrassing to the firm or might cause "customer or employee disgruntlement." Health and safety studies might be withheld under this rule only if the firm made a strong showing that their release would affect its position in relation to its rivals.[122]

(1992). The FDA, however, continues to treat health and safety studies and data as subject to Exemption 4 of FOIA. This policy has been criticized. See the arguments and sources in Robert M. Halperin, comment, *FDA Disclosure of Safety and Effectiveness Data: A Legal and Policy Analysis*, 1979 DUKE L.J. 286 (1979); Richard S. Fortunato, Comment, *FDA Disclosure of Safety and Efficacy Data: The Scope of Section 301(j)*, 52 FORDHAM L. REV. 1280 (1984). It is now being formally reconsidered.

120. 704 F.2d 1280, 1288 (D.C. Cir. 1983).

121. *Id.* at 1286-87; *see* Anderson v. Department of Health & Human Servs., 907 F.2d 936 (10th Cir. 1990) (personal injury plaintiff obtained health and safety studies and related documents under protective order in state court, then sought public disclosure of documents pursuant to FOIA in order to warn others of the dangers of liquid silicone injections); Van Strum v. EPA, 680 F. Supp. 349 (D. Or. 1987), 881 F.2d 1085 (9th Cir. 1989), *on reappeal*, 892 F.2d 1048 (9th Cir. 1990); Westinghouse Elec. Corp. v. United States Nuclear Regulatory Comm'n, 555 F.2d 82 (3d. Cir. 1977) (finding agency's disclosure policy authorized by statute and is constitutional); *see also* Critical Mass Energy Project v. Nuclear Regulatory Comm'n, 830 F.2d 278 (D.C. Cir. 1987) (NRC must establish, pursuant to "confidential, commercial information" provision of FOIA Exemption 4, that disclosure would impair its ability to obtain necessary information in the future); CNA Fin. Corp. v. Donovan, 830 F.2d 1132 (D.C. Cir. 1987) (district court's determination that affirmative action information did not come within the competitive harm exemption was reasonable); AT&T Info. Sys., Inc. v. General Servs. Admin., 627 F. Supp. 1396 (D.D.C. 1986); Teich v. Food & Drug Admin., 751 F. Supp. 243 (D.D.C. 1990) (animal studies on the health effects of breast implants were not confidential commercial information protected from disclosure by Exemption 4, as release of studies showing negative effects would be in the public interest, the disclosure request did not seek raw data on other studies, and some of the studies were 20 years old and would not affect the competitive positions of the manufacturer); St. Paul's Benevolent Educ. & Missionary Inst. v. United States, 506 F. Supp. 822 (N.D. Ga. 1980) (timing of release of data on feeding of infants in low-income families submitted to Centers for Disease Control could not be controlled as submitter was not placed at competitive disadvantage, had not kept it secret, and was type of information normally disclosed); Washington Research Project, Inc. v. Dep't of Health, Educ. & Welfare, 504 F.2d 238 (D.C. Cir. 1974) (disclosure of scientific research submitted to National Institute of Mental Health would not place submitter at competitive disadvantage as it was not-for-profit institution), *cert. denied*, 421 U.S. 963 (1975); Brockway v. Dep't of the Air Force, 518 F.2d 1184 (8th Cir. 1975) (witness statements regarding airplane crash); Consumers Union v. Veterans' Admin., 301 F. Supp. 796 (S.D.N.Y. 1969), *appeal dismissed*, 436 F.2d 1363 (2d Cir. 1971).

122. *Public Citizen*, 704 F.2d at 1291 n.30; General Elec. Co. v. United States Nuclear Regulatory Comm'n, 750 F. Supp. 1394, 1402 (7th Cir. 1984); CNA Fin. Corp., 830 F.2d at 1154; Badhwar v. Department of the Air Force, 622 F. Supp. at 1364, 1377 (D.C. Cir. 1985).

The Supreme Court addressed the issue in *Ruckelshaus v. Monsanto*,[123] where Monsanto claimed that the EPA had effected an unconstitutional taking for private use by sharing its health and safety studies with another company. The FIFRA statutory scheme provided that the EPA could rely on one pesticide registrant's studies to evaluate another's application. It also provided that the later applicant must reimburse the first one for the use of the studies and, if an agreement could not be reached, arbitration would settle the matter.[124] The controlling statute had been revised twice in the time period relevant to the case. The 1947 statute was silent, but in the 1972 version of the law, there was an explicit statutory promise of confidentiality. The 1978 amendments reversed this by explicitly establishing the agency's authority to disclose health and safety data to rivals and to the public.[125]

The Supreme Court found that Monsanto had an interest in the data which was in the nature of a property interest in trade secrets and that the extent of this interest was controlled by state common law and was not subject to federal agency modification.[126] The Court held, however, that the EPA's use of the data was not a taking, except during the period in which the company had a "reasonable investment-backed expectation" of confidentiality, from 1972 until 1978, when Congress had explicitly given such an assurance.[127] The Court affirmed the police power authority of the EPA to disclose this type of information in the course of regulation[128] and held that the FTSA is not a guarantee of confidentiality to submitters of data because the FTSA does not provide a basis for an expectation of confidentiality in a regulatory field where health issues are a concern.[129]

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123. 467 U.S. 986 (1984).

124. 7 U.S.C. § 136 (Cum. Supp. 1992).

125. The 1978 amendments overruled Mobay Chemical Corp. v. Costle, 517 F. Supp. 252 (W.D. Pa. 1981), *aff'd*, 682 F.2d 419 (3d Cir.), *cert. denied*, (459 U.S. 988 (1982), and Chevron Chemical Co. v. Costle, 443 F. Supp. 1024 (N.D. Cal. 1978).

126. *Ruckelshaus*, 467 U.S. at 1003-04 (EPA had stipulated that the company had protected proprietary interests in the data, but the Court undertook its own analysis). Pamela Samuelson has done a careful analysis of the case and the Court's treatment of the property issue. *See* Pamela Samuelson, *Information as Property: Do Ruckelshaus and Carpenter Signal a Changing Direction in Intellectual Property Law?*, 38 CATH. U. L. REV. 365 (1989). Samuelson notes that the Court seemed to rely on state law, but actually just stated that Missouri law has adopted the Restatement definition of trade secrets and cited three state cases, two of which did not hold that trade secrets are property and the third of which was decided two decades prior to the Restatement's publication. *Id.* at 379.

127. *Ruckelshaus*, 467 U.S. at 1005.

128. *Id.* at 1016. The Court found that the EPA's use had been for a public purpose. The Court stated that it is for Congress to decide on the optimum amount of disclosure, but observed that "public disclosure can provide an effective check on the decisionmaking of EPA and allows members of the public to determine the likelihood of individualized risks peculiar to their use of the product." *Id.*

129. *Id.* at 1009.

> In an industry that has long been the focus of great public concern and significant government regulation, the possibility was substantial that the Federal Government, which had thus far taken no position on disclosure of health, safety, and environmental data concerning pesticides, upon focusing on the issue, would find

The *Ruckelshaus* decision set some basic ground rules for agencies handling environmental information. First, the scope of the proprietary interest is determined by common law.[130] Second, the agency need not recognize or defer to it in any way which is different from deference accorded other interests which may be affected by an exercise of the police power. Third, in areas where health protection is an apparent concern, expectations of confidentiality are not reasonable absent some affirmative assurance from Congress. [131]

The Supreme Court's decision in *Ruckelshaus* was made in 1984, when the Occupational Safety and Health Administration ("OSHA") was establishing its hazard communication standard, which would become the model for handling trade secrecy in federal right-to-know and toxics inventory programs.[132] The agency's initial policy was consistent with the Supreme Court's broad permission to agencies to require disclosure, but later it changed to a posture that was highly deferential to trade secret claims.[133] Since the OSHA process laid the groundwork for later federal regulatory approaches to the problem, it is worth examining in some detail.

OSHA first proposed its hazard communication standard in the last days of the Carter Administration. This version would have required disclosure of chemical identity without a trade secret exemption, but it invited comment on this point.[134] The agency then issued a modified proposal,[135] which required broad disclosure using a two-tiered approach:

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disclosure to be in the public interest.

Id. at 1008-09.

Although a compensable taking of that property could occur to the extent the claimant had a reasonable investment-backed expectation of protection of the property, in fields where regulation is likely, such an expectation will exist only if it is affirmatively encouraged by the legislature. It took a statute promising confidentiality to create such an expectation in this setting and lower courts have read the decision this way. Manufacturers Ass'n of Tri-County v. Knepper, 623 F. Supp. 1066, 1076 (M.D. Pa. 1985), *aff'd in part, rev'd in part*, 801 F.2d 130 (3d Cir. 1986), *cert. denied*, 484 U.S. 815 (1987); New Jersey State Chamber of Commerce v. Hughey, 600 F. Supp. 606 (D.N.J. 1985). This reading is criticized in John C. Jenka, comment, *Federal Disclosure Statutes and the Fifth Amendment: The New Status of Trade Secrets*, 54 CHI. L. REV. 334 (1987). In *Ruckelshaus*, Justice O'Connor would have remanded for factfinding on actual expectations prior to the statutes. *Ruckelshaus*, 467 U.S. at 1024.

130. *Ruckelshaus*, 467 U.S. at 1001-04.

131. *Id.* at 1009.

132. State laws were also influenced by the OSHA standard. State right-to-know requirements proliferated in the late 1970's and early 1980's and mandated disclosure of the identity and nature of workplace hazards from chemical exposure. State statutes varied in their treatment of trade secrets. Some provided protection; others gave limited protection, depending on the toxicity of the chemicals; and others required full disclosure of all hazards. States also established different procedures for claiming and contesting trade secrecy. *See* Lyndon, *supra* note 106.

133. The rule's history suggests that the policymaking process was influenced by a new policy initiative introduced by the Reagan Administration. Lyndon, *supra* note 106 (discussing privatization in the 1980's of government data, encouragement of private information service, and the issues raised by these policies).

134. 46 Fed. Reg. 4412, 4426-27 (1981).

135. 47 Fed. Reg. 12,092, 12,105-06 (1982). This proposal was modeled on New Jersey's law, which was similar in this respect to that of Massachusetts and Pennsylvania. Disclosure was required for carcinogens, mutagens, teratogens, and chemicals which cause significant irreversible damage to human organs or body systems. *Id.*

employers could withhold trade secret data unless the chemicals were a "high chronic hazard," and there existed a need to know the precise chemical names. OSHA declared that disclosure of chemical identity data is crucial to a hazard communication system since it is "the passkey to the scientific literature." OSHA pointed out that workers, scientists, and purchasers of chemical products must be able to consult others about the hazards in the workplace and they cannot do this without knowing the chemical identity of the substances.[136] The agency noted that a chemical may be a trade secret in one work context and not in another, though it will be equally hazardous in either place. It also noted that since trade secrecy is basically a matter of self-definition, permitting nondisclosure of trade secrets might result in considerable overclassification of trade secrets. OSHA acknowledged that it did not have the resources to screen or adjudicate all trade secret claims and pointed to the availability of civil remedies for injured trade secret claimants. Finally, it explained that the compromise it reached was an attempt to balance the two competing interests, but that any unavoidable conflict should be decided in favor of the health interest.[137]

As part of the rulemaking, OSHA completed a Regulatory Impact Analysis ("RIA"), which concluded that the value of the rules' benefits in the form of reduced mortality and disabling illness, fewer lost workdays, lower medical costs, increased production, and fewer turnovers, would be nearly twice their costs.[138] Concerning trade secrets, the RIA noted that smaller firms might be affected if they rely on a few unique chemical products or processes, but comparative advantages in small firms, which rely less on secrecy than on location or individual abilities, would be unaffected.[139] It also suggested that most chemical R&D has been con-

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136. 47 Fed. Reg. 12,107.

> Since exact chemical identity is the passkey to the scientific literature, this information must be available to an industrial hygienist or other health professional who is evaluating the hazards associated with a chemical, attempting to double-check a hazard identification made by somebody else, or updating an earlier evaluation with the latest scientific knowledge. Likewise, it must be available to an epidemiologist who is attempting to link patterns of disease with exposure to a particular chemical; to a downstream employer who may be contemplating using a chemical in conjunction with other chemicals or in a manner not foreseen by the manufactures; and to a treating physician who suspects that a patient's health problems may be the result of chemical exposure.

Id. at 12,105-06.

137. 47 Fed. Reg. 12,107. OSHA located its authority to require disclosure of trade secrets in federal preemption doctrine. It noted that, in analogous situations, courts have adopted a balancing approach favorable to health and safety interests and cited section 15 of the OSHA Act (29 U.S.C. 664) and American Textile Manufacturers Institute v. Donovan, 452 U.S. 490 (1981), where the Supreme Court found that, in passing OSHA's authorizing legislation, Congress itself decided that hard cost and benefit choices must be guided by a rule that favors employee health. *See also* 47 Fed. Reg. 12,107-08. *But see* Chrysler Corp. v. Brown, 441 U.S. 281 (1979).

138. 48 Fed. Reg. 53,329 (1983).

139. Final Regulatory Impact Analysis and Regulatory Flexibility Analysis of the Hazard Communications Proposal, U.S. Dep't of Labor, OSHA (Aug. 9, 1983).

ducted by four firms.[140] Disclosure might contribute to industry concentration, but a study of regulation and chemical innovation conducted by the Conservation Foundation had concluded that earlier regulation had not had that effect. The authors of that study concluded that regulatory delay is likely to be a more important factor in innovation decisions than direct costs.[141] Because the OSHA standard would not introduce delays, the RIA found that the impact on innovation would be minor. The RIA also noted that since reverse engineering is available for most chemical mixtures, common law trade secrecy standards can rarely be met anyway. Innovation and appropriability rationales were therefore assessed and found too weak to trump the need for disclosure.

After the Reagan Administration took office, however, OSHA issued its final rule, and a dramatic change in its view of trade secrets was evident. OSHA rejected the industry argument that only general hazards and risk estimates should be communicated, and it confirmed the requirement of chemical identity disclosure for most substances; however, OSHA now spoke of "[t]he critical need to protect trade secret information because the economic well-being of the employer and its employees may be dependent upon the protection of such information, and once lost, its value as a trade secret cannot be recaptured."[142] Unlike the RIA's conclusions, OSHA's final position focused only on the present private value of the trade secrets and not on the social value of disclosure. Nor was the central argument essentially an economic one; it focused not on encouraging innovation, but on protecting existing stakes.

The final rule removed the provision that high chronic hazards must be disclosed.[143] It strictly limited access to trade secret chemical identities, barring access even by workers and their designated representatives. Only health professionals were now included and firms could require them to agree to terms of liquidated or punitive damages in confidentiality agree-

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140. *Id.* Over 60% of R&D funds for industrial chemicals are spent by four companies; only 2% of TSCA notices are submitted by firms with sales under $10 million. Davies notes that some industry representatives maintain the latter figure reflects TSCA's effect on the industry, not the low likelihood that it will affect industry structure. J. Clarence Davies, *The Effects of Federal Regulation on Chemical Industry Innovation*, 46 LAW & CONTEMP. PROBS. 41, 47 (1983).

Regulatory effects would vary among companies, but overall the chemical industry has consistently been an especially healthy sector of the economy. See E. C. Holmer, *The Chemical Industry: Challenges, Risks, Rewards, in* RALPH LANDAU & NATHAN ROSENBERG, THE POSITIVE SUM STRATEGY (1986). The chemical industry has been generating a favorable trade balance in excess of $10 billion.

141. *Product Regulation and Innovation*, THE CONSERVATION FOUNDATION, Mar. 1980, at E-3.

142. 48 Fed. Reg. 53,280, 53,312.

143. 48 Fed. Reg. 53,315-16. The proposal had equated "high chronic hazard" with any "carcinogen, mutagen, teratogen, or a cause of significant irreversible damage to human organs or body systems." OSHA found little support in the comments for making distinctions between these chemicals and other hazardous chemicals. Some commenters criticized the lack of definitions for the critical terms which made the provision vague. Exs. 19-44, 19-46, 19-63, 19-65, 19-76, 19-89, 19-109, 19-123, 19-155, 19-164, 19-196, 19-204, 19-219; Tr. 2185, 2200-1, 1214. Some thought that unless narrowly defined, the terms would result in trade secrets being categorized too often as "high chronic hazards." Exs. 19-44, 19-46. On the other hand, the American Lung Association commented that chemicals which cause acute toxic effects should be disclosed regardless of trade secrecy. Ex. 19-154. The Federal Advisory Council on Occupational Safety and Health, Ex. 125, and the AFL-CIO and supporting unions recommended the use of more inclusive terms, Ex. 180A.

ments.[144] OSHA also broadened the Restatement definition of trade secrets, adding a phrase intended to provide protection for chemical identities, whether or not they could be discovered by reverse engineering.

To explain its turnabout, OSHA quoted extensively from the comments of the Chemical Manufacturers Association and several companies which had maintained that disclosure of generic chemical names, accompanied by any existing health effects information, should be sufficient health protection. The flavors and fragrance industry took the lead, arguing that disclosure of chemical identity would have disastrous economic consequences for some companies.[145] This claim was lent rhetorical force by invocation of "competition" on the side of secrecy, with the suggestion that disclosure will cause "competitive harm," in that the claimant's market position relative to its rivals might be affected.[146]

Numerous manufacturers, as well as unions and public health experts, were in favor of disclosure.[147] "Downstream" employers, who purchase

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144. This requirement had earlier been rejected by OSHA in the context of medical record access. A number of commenters stated that confidentiality agreements, with or without bonding or liquidated damages provisions, would be ineffective in protecting their economic interests. Bonding appeared especially to be unavailable under these circumstances. 48 Fed. Reg. at 53,319; *see, e.g.*, the comments of the flavor and fragrance industries in Ex. 27-15, and the AFL-CIO, Ex. 180A. OSHA found that liquidated damages provisions might provide clarity, which it termed a benefit for both parties. 48 Fed. Reg. 53,319.

145. The flavors and fragrance manufacturers appear to have been the group most concerned with the rule. They argued that trade secret information should be disclosed only in those cases where there is a significant hazard to workers and the disclosure will significantly alleviate the hazard. D. Thompson, Flavor and Extract Manufacturers Association, Fragrance Materials Association, Ex. 27-15, 48 Fed. Reg. 53,318. See also the comments of Master Chemical, Inc., small chemical processors. Ex. 19-87, 48 Fed. Reg. 53,313.

The comments contained little evidence of the value of any trade secrets. The Chemical Manufacturers Association was driven to make the completely circular argument that:

> the very existence of the extensive legal protection afforded under the patent system and trade secret law attests to the importance of encouraging research by permitting those who develop a new product to obtain financial rewards from the sale of that product.

48 Fed. Reg. 53,313.

146. Milgrim uses the term "competitive" in this sense. Stevenson notes this is inexact and overbroad, if not self-serving. Stevenson, *supra* note 2, at 8-9. Disclosure and diffusion as well may serve competition. *See* section I. Scherer provided the term rivalry to indicate the individual firms' relationship, as opposed to the market's dynamic. *See* SCHERER, *supra* note 80.

147. For example, Caterpillar Tractor Company disputed both arguments made against disclosure:

> Some chemical manufacturers have contended that the use of generic classifications, in conjunction with their assessment of the potential hazards, would provide sufficient information for users to determine the requirement for safe usage. We feel that their argument falls short since chemical manufacturers cannot be familiar with the variety of ways in which their products may ultimately be used. With modern analytical laboratory equipment, and a limited amount of time and funding, the constituents of most chemical products can be readily identified . . . .
>
> We feel that benefits to be derived in fully disclosing the constituents of a hazardous material far outweigh the risk (real or imagined) that may be incurred by chemical manufacturers as a result of disclosing this information.

The American Paper Institute, Ex. 1973, 48 Fed. Reg. 53,313. Unions and other employee advocates argued that only the basic confidentiality agreements permitted by the medical records access rule should be permitted. Exhibits cited at 48 Fed. Reg. 53,313. For instance, the AFL-CIO maintained that chemical identity, not hazard warning information, is the essential ingredient of a hazard communication standard. Ex. 180A.

chemicals from chemical manufacturers, generally expressed views similar to the unions. For instance, the Caterpillar Tractor Company commented that identifying chemicals by broad generic chemical classifications would substantially hinder the efforts of its safety and health professionals to determine the requirements for safe usage of specific products.[148] Several firms expressed skepticism about the extent or value of actual secrecy in the chemicals industry.

There was also testimony that with modern gas chromatography and mass spectrometry, laboratory analysis of the chemical content of any product is so easy that chemical identity cannot properly be considered secret.[149] The proponents of confidentiality argued that the cost of analyzing mixtures will often be high and, even then, the precise identity often will not be decipherable.[150] Unions responded that, on this basis, much information will only be kept secret from those without financial resources—from workers rather than from trade rivals.[151]

On petition for review, the Third Circuit Court of Appeals found that OSHA had defined "trade secret" too broadly and had imposed burdensome conditions on access to information.[152] While trade secret protection may arise either from state law or from federal statute,[153] the court found that the OSHA Act does not create trade secret protection,

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148. The Caterpillar Tractor Company testified along with West Point Pepperell, The National Paint and Coatings Association, and the Motor Vehicle Manufacturers Association that precise chemical identity is essential to downstream employers hazard assessment.

149. Caterpillar Tractor Company, Ex. 19-20; California Dep't of Industrial Relations, Ex. 22C-8. 48 Fed. Reg. 53,314.

150. The CMA cited a Proctor & Gamble estimate that an analysis of its Bold-3, would cost as much as $300,000 and might still be unsuccessful. Ex. 19-91, 48 Fed. Reg. 53,314; Mr. Wallace Dempsey, Fragrance Materials Association, Tr. 3417. Master Chemical Corporation testified that the cost of the procedures ranged from between $50,000 and $1 million dollars or more per sample, with no guarantee that the exact composition will be determined. Ex. 19-87.

151. A representative of the United Steelworkers of America testified:

> Typically a trade secret is claimed in a case where a solvent manufacturer's supplier, for example, takes a—let's say an aliphatic hydrocarbon and adds a chlorinated hydrocarbon to raise the flash point, sells it as safety solvent, charges three times for the mixture what his costs were for the ingredient, says that's trade secret. Now, you know, in all those cases the buyer or a competitor could easily obtain it and analyze it, if they cared to. So it's really not a trade secret from anyone except the workers forced to use it.

Mr. Michael Wright, Tr. 854, 48 Fed. Reg. 53,314.

152. United Steelworkers of America v. Auchter, 763 F.2d 728, 739 (3d Cir. 1985). The agency's authority to preempt state laws was upheld. *Id.* OSHA's rules applied only to the manufacturing sector, but the court ordered the agency to promulgate standards for other industries, unless it could state why such standards would not be feasible.

The Third Circuit later ruled specifically on preemption of trade secrets. In New Jersey State Chamber of Commerce v. Hughey, 600 F. Supp. 606 (D.N.J), *aff'd in part, rev'd in part*, 724 F.2d 587 (3d Cir. 1985), several industry associations and some companies sought to enjoin the implementation of New Jersey's Right-to-Know Law on the ground that the OSHA regulations preempted the state law and that the law's trade secret provisions constituted a compensable taking. The district court agreed that the OSHA regulations preempted the state law as to manufacturing employers, found that trade secrets are constitutionally protected property rights under New Jersey law, and held that mandated disclosures of trade secrets were not "takings" which triggered a right to compensation.

153. Ruckelshaus v. Mansanto, 467 U.S. 986, 1008, (1984); Chevron Chem. Co. v. Costle, 641 F.2d 104, 115 (3d. Cir. 1981), *cert. denied*, 452 U.S. 961 (1981).

but directs the agency to treat data as trade secrets only to the extent that state law does so.[154] OSHA's elaboration on the Restatement definition of trade secrets was therefore improper.

On its own initiative, the court noted that the agency's earlier proposal, which required full disclosure of hazardous ingredients, was consistent with OSHA's statement of its general policy "that the interests of employee safety and health are best served by full disclosure of chemical identity information."[155] The court also discussed the basic relationship between trade secrecy and regulation. Citing its own decision in *Westinghouse Electric Corp. v. United States Nuclear Regulatory Commission*[156] and the Supreme Court's decision in *Ruckelshaus*, it stated that trade secrets are not constitutionally protected from the regulatory process.[157] The court bluntly told OSHA that it need not be so cautious: "These cases suggest that a regulation requiring disclosure even of formula or process information as a precondition for the sale of hazardous products for use in the workplace would be valid."[158] The court noted that section 6 of the Act directs the agency to set standards to assure that no employee will suffer material impairment of health effects,[159] and quoted the Supreme Court's decision in *American Textile Manufacturers Institute v. Donovan*,[160] finding that the agency is not permitted to balance employee safety against competing economic concerns. The court remanded the trade secrecy rule for reconsideration of the definition of trade secrets, with the specific instruction that it not include chemical identity information that is readily discoverable through reverse engineering.[161]

OSHA's final standard preserved trade secret access almost as it was before the court of appeals decision. An employer may withhold any chemical identity information claimed as a trade secret, but must specify on warning labels that it is doing so. Disclosure to workers, medical personnel, and researchers may be conditioned on signing a confidentiality agreement, which may include stipulation of a "reasonable pre-estimate of likely damages," but may not require the posting of a penalty bond.[162] Conflicts over information requests are resolved by appeal to the agency, a laborious process for the petitioner.[163]

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154. 29 U.S.C. § 664 (1988).
155. 48 Fed. Reg. 53,312 (1983); *United Steelworkers*, 763 F.2d at 741-42.
156. 555 F.2d 82 (3d Cir. 1977).
157. *United Steelworkers*, 763 F.2d at 741.
158. *Id.*
159. 29 U.S.C. § 655(b)(5) (1988).
160. 452 U.S. 490, 509 (1981) (interpreting section 6(b)(5) of the Act).
161. *United Steelworkers*, 763 F.2d at 743.
162. 29 C.F.R. § 1910.1200(i) (1991).
163. *Id.* § 1900.1200. A manufacturer or employer may withhold chemical identity from a Material Safety Data Sheet ("MSDS") provided that (i) the trade secret claim can be supported; (ii) the MSDS contains the information concerning the properties and effects of the chemical; (iii) the MSDS indicates that the information is being withheld as a trade secret; and (iv) the specific chemical identity is made available to a treating physician or nurse on an emergency basis without qualifying statements of agreements and in a nonemergency to an employee, union representative or health professional who gives a detailed statement of the need for the information and signs a

The OSHA rule has become the model for other federal environmental information programs. The 1986 Amendments to the Superfund law established the two new information programs.[164] One of these is the National Toxics Inventory ("NTI"), a survey of discharges of about 300 specified toxic chemicals.[165]

Disclosure of specific chemical identity was a difficult issue in EPA's rulemaking on reporting requirements for the NTI,[166] but secrecy advocates were even more successful here than at OSHA.[167] Although the Emergency Planning and Community Right-to-Know Act ("EPCRA") aims to protect trade secrecy, its major thrust is disclosure to facilitate pollution control

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written confidentiality agreement. The employee who denies a request for access must do so in writing within thirty days of the request and include evidence to substantiate the trade secret claim, state the reasons why the request is being denied and explain in detail how alternative information may satisfy the specific medical or occupational health need without revealing the specific chemical identity.

The person whose request is denied may then refer the matter to OSHA, which shall consider the evidence to determine if: (i) the trade secret claim has been supported; (ii) the claim that there is a medical or occupational health need for the information has been supported; and (iii) the requester has demonstrated adequate means to protect confidentiality.

If OSHA decides that the information is not a trade secret or that the requester has made the requisite demonstration, the manufacturer will be subject to citation. If the requester's showing of ability to protect the information is insufficient, OSHA may issue an order releasing the information, but require additional protection for it. If, after OSHA orders release and issues citations, the chemical manufacturer continues to withhold the information, the matter may be referred to the Occupational Safety and Health Review Commission for enforcement of the citation. An administrative law judge may review the citation in camera and issue appropriate protective orders.

164. 42 U.S.C. § 11042 (1988). The first program requires all companies which are subject to the OSHA hazard communication standard to disclose the amounts and locations of stored toxic chemicals to local government agencies concerned with emergency preparedness. It also directs the companies and localities to take steps to be prepared for emergency spills or releases. This program is decentralized, like OSHA's, and has suffered from uneven implementation due to lack of funding. The trade secret provisions in the statute leave considerable discretion about disclosure in the hands of the local agencies.

165. 42 U.S.C. §§ 11042, 11043, 11048 (1988); 40 C.F.R. §§ 350 to 350.40 (1992).

166. Comments of several toxicologists stressed the importance of access to chemical identity data. *See supra* note 142 and accompanying text; Docket Number 300-PQ-TS, Comments of William H. McBeath, M.D., M.P.H. Executive Director, American Public Health Association and Fran DuMelle, Director, Government Relations, American Lung Association; Comments of Thomas L. Kurt M.D., M.P.H., North Central Texas Poison Center; Comments of Geoffrey A. Langley, Corporate Manager of Emergency Response, Petrochem Services, Inc., a hazardous material emergency cleanup contractor; Comments of Deborah Sheiman, Natural Resources Defense Council; comments of Gary D. Bass, Ph.D., Executive Director of OMB Watch. *But see, e.g.*, Comments of Richard C. Wilson, Jr., of Ashland Petroleum company (stating that commercial experience with toll-free hotline indicates that health professionals inquire about emergency procedures, but rarely about specific chemical identity of trade secret ingredients); Comments of James T. O'Reilly, Corporation Counsel-Product Safety, Procter & Gamble Company (saying that specific chemical identity not generally necessary for specific diagnosis as "a genuinely interested health professional already knows much about the illness or acute reaction, from differential diagnoses that differentiate among causative factors.").

167. The final NTI rule provides that to withhold a chemical identity a firm must show that disclosure is likely to cause substantial harm to the company's competitive position, the chemical identity is not "readily discoverable" through reverse engineering or analysis of the company's discharges or products, and the information has not been disclosed, except under legal compulsion or the cloak of a confidentiality agreement. Also, the information must not be subject to disclosure under any federal or state law. OMB WATCH, USING COMMUNITY RIGHT TO KNOW: A GUIDE TO NEW FEDERAL LAW; 42 U.S.C. § 11042.

and emergency preparedness.[168] Nevertheless, trade secret claimants persuaded the EPA that Congress intended to preclude disclosure of specific health effects data, if this would reveal trade secret chemical identity. The problem would arise in some cases because so little study has been done on the health effects of many chemicals that to reveal a known effect will identify the chemical. The EPA, believing that trade secrecy is a "property" interest that requires a "balancing of interests," has established an informal practice of crafting health effects descriptions so as not to reveal chemical identity.[169] For example, EPA's rule allows a claimant to report "organ effects," if the identity of the particular body organ affected would contribute to a discovery of the offending chemical's identity.[170] Critics of this approach have pointed out that such general descriptions are medically useless.[171]

The EPA's resolution of the matter is consistent with the FDA's and OSHA's persistence in honoring trade secret claims, even where there is clear statutory authority or even a mandate to disclose.[172] While the federal courts have been relatively resistant to expanding trade secrecy privileges in the past decade, agencies continue to favor secrecy over disclosure. Part of the explanation for this is the Reagan and Bush Administrations' program of encouraging the "information economy" by expanding private rights to information—including information produced by the government.[173] This approach is based largely on property principles and it misses the fine points of information economics, such as the limits on what the market can produce and the costs of maintaining technical information.[174] Unions and proponents of access have not pressed the confidentiality issue, perhaps because their resources have been taxed defending more basic claims put into question by the new policies.

Another influence may be the fact that agencies, legislatures, and unions are outsiders to the trade secret situation and are therefore subject to the Pandora's Box effect, which counsels the decisionmaker not to pull on a thread which may unravel the fabric. OSHA's final notice echoed the industry refrain that a secret must be closely guarded because once lost, it can never be recaptured. The agency speculated that the consequences of such a loss might be that many jobs would be affected and

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168. The statute states, "In any case in which the identity of a toxic chemical is claimed as a trade secret, the Administrator shall identify adverse health and environmental effects associated with the toxic chemical and shall assure that such information . . . is provided to any person requesting information about such toxic chemical." 42 U.S.C. § 11042(h)(2).

169. Telephone conversation with Steven Neuburg-Rinn, EPA counsel (Feb. 8, 1991).

170. *See generally* 52 Fed. Reg. 38,312 (1987).

171. *See* comments in EPA Docket 300 PQTS7, Trade Secrecy Rules Under SARA Title III, of William H. McBeath, M.D., Executive Director of the American Public Health Association, and Fran DuNuelle, Director of Government Relations of the American Lung Association; *see also* comments of Thomas L. Kurt, M.D., of the North Central Texas Poison Center, and comments of the Natural Resources Defense Council (Sheiman); Toxicity Testing, pp. 229, 243.

172. 42 U.S.C. § 11042(h)(2).

173. *See* Lyndon, *supra* note 106.

174. *See infra* section IV. For a discussion of information policies since 1980, see VINCENT MOSCO & JANET WASKO, THE POLITICAL ECONOMY OF INFORMATION (1988); Lyndon, *supra* note 106.

that the workers and employers alike might be seriously damaged. This kind of anxious expression illustrates the emotional appeal of the argument, based on fear of loss of control. In the setting of hazard communication, widespread unravelling may have seemed a real possibility, since the rule covered all the nation's employers. What if one worker in each firm, in each industry, defected to a rival with valuable secrets? Better to let the firms keep the lid on the box. The economic evidence reviewed in section I suggests, however, that such a disaster is unlikely.

B. The Costs of Secrecy

The current OSHA and EPA disclosure arrangement essentially attempts to control access to data so that "free riders" cannot dilute its commercial value, while allowing those who can show that they need the data for specific noncommercial reasons to use it for diagnosis or research. Unfortunately, this compromise is far from satisfactory, if it is workable at all. Secrecy of chemical identities imposes a variety of costs on all participants in regulation and has impacts outside the ambit of toxics regulation. Some of the problems with EPA's and OSHA's compromise stem from the basic incompatibility between secrecy rules and disclosure rules. Other difficulties result from the fact that the common law moorings of trade secrecy are essential to its function.

In the common law context, a trade secrecy claim alleges misbehavior by the defendant, that is, illegitimate acquisition of information. The basic trade secret defenses revolve around the actual availability of the information, its value in the industry, and notice of intent to maintain secrecy. Transplanted from its roots, trade secrecy becomes a different creature altogether. For instance, the litigation process is transformed. Rather than an entitlement which the plaintiff seeks to vindicate, secrecy becomes a defense to regulation; information is presumptively secret rather than available; as a practical matter, the burden of going forward and the burden of persuasion are shifted; and there are no commercial rivals present to provide evidence on the key issues of the information's availability and its value in the trade.

In regulation, trade secrecy becomes a broad abstraction, a "rule" which applies to cases which are not in court. The common law discipline of particular fact finding and the flexibility of equitable balancing are not available. Regulators are trying to decide for all products as a generic category, for all values of the information, and for all symptoms of exposure. Some issues come up which would be theoretical in the common law context; for example, if a secret can be reverse engineered, but no one actually does it, how should the law treat it? These differences were not noticed in the incremental transition of common law trade secrecy into modern disclosure laws, but they result in a series of practical and legal problems.

For a worker or neighbor seeking data from a company, trade secret information is, as a practical matter, simply unavailable.[175] There is no

175. OSHA's trade secrecy rules present an example of legal centralism noted by Coase and

incentive for an employer to disclose.[176] If the secret may be at all valuable, a firm will do best to make general statements and wait to see if the seeker can follow through on the request for the data. The regulatory road to disclosure is arduous. The administrative process is cumbersome and has greater procedural burdens than parallel common law litigation. OSHA's rules require a showing of medical need for the information, proof of adequate means to keep the data confidential, and sometimes the posting of a bond. Moreover, in the usual common law case, both parties are in the industry and are likely to have relevant evidence, whereas in environmental regulation, the petitioner is an outsider. How can an outsider show that the information is not actually secret or is without competitive value?[177] The agency can go through the motions of reviewing claims, relying on symbols of value that courts rely upon, but there is no good source of contrary information in the agency forum. The common law of trade secrecy was designed to operate in the particular forum of conflict between market rivals. In the administrative setting, even if rivals were present, their interests are not those of the agency or worker, as regulation tends to promote solidarity within an industry.

Current rules thus effectively give firms a full trade secret exemption. The agency whose mandate is to foster health protection ends up in the anomalous position of "sanitizing" and protecting industry documents, editing chemical identities and health information out of disclosure systems, and thinking up ways of describing health effects so that no one will figure out what they are. Health regulators are put in the position of deciding matters about which they have little expertise—whether a chemical is a trade secret and what its commercial value is. A regressive circularity is injected into toxics regulation, because if it is not revealed, a chemical will not be studied and therefore will not be found toxic.

Trade secret claimants themselves are not well protected by current rules. While they are in a stronger procedural posture under OSHA's rules than under the NTI system, any reporting requirement increases the risk of disclosure to rivals. Firms are under pressure from the common

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Ellickson. *See* Robert C. Ellickson, *The Case for Coase and Against Coasianism*, 99 YALE L.J. 611, 613 n.17 (1989). Ellickson points out that "a rational actor, peering unconfidently through the fog that separates ordinary people from legal rules and institutions, will ignore how the legal system sets entitlements when he calculates that his expected costs of learning and enforcing his legal entitlements would exceed the expected value of those entitlements to him." *Id.* at 613. Nelkin and Brown report that management policies on controlling information include express and implicit threats which prevent workers from making use of the entitlements to hazard information; those who pursue inquiries may be labelled troublemakers. *See* DOROTHY NELKIN & MICHAEL S. BROWN, WORKERS AT RISK 158-62 (1984).

176. *See generally* Susan D. Carle, *A Hazardous Mix: Discretion to Disclose and Incentives to Suppress Under OSHA's Hazard Communication Standard*, 97 YALE L.J. 581 (1988). No one is paying for the information in the hazard communication system. Viscusi says that cheap information must be favorable. Schwartz and Wilde suggest that government should intervene to provide certain information itself or to promote third party provision of it, rather than relying on the product source to do so. With this theory, a manufacturer should provide only the chemical identity information and the government should sponsor third party research. *Id.*; Lyndon, *supra* note 106.

177. It may be cheaper for a firm to create trappings of trade secrecy to impress an agency reviewer than to risk toxicity studies.

law to demand strict confidentiality agreements; but they must be concerned that, aside from the in terrorem effect of signing an agreement, workers, local residents, or researchers who are let in on a secret will have little incentive to guard it closely. Rather, they will need to communicate it in the course of pursuing their own interests. If a secret is then somehow revealed to rivals, the odds of financial recovery are low, as worker and researcher defendants will not have deep pockets or be well insured. Enforcement of confidentiality agreements will be difficult, because courts are likely to sympathize with the defendant in this context.

Indeed, a host of difficult fairness issues are implicit in these agreements. Confidentiality requirements mean that exposed persons and researchers will not be able to confer freely with others about potential health problems. This raises a number of rights problems and ethical dilemmas. For instance, the rule discourages medical consultation. It also undermines the hazard communication system because it prevents people from checking a firm's hazard assessment; thus, it will not be reviewed or referenced to ongoing research, although it may be incorrect or become stale. Comparison between symptoms and exposures, starting from the informed hunch of the individual clinician, is the fuel of the discipline of epidemiology.[178] The research agenda may be skewed by its reliance on partial exposure data. Distortions in signals may become accepted and not questioned, as omitted items are frozen out of the information exchange process.[179]

Limits on peer review are particularly troubling in the setting of strong commercial disincentives to discovering and communicating toxicity. A trade secret exemption is an option of invisibility and allows a firm to do a minimal study and be off the hook. Chemicals may never reach standard setting phase, because of the inadequacy of health data.

Feedback from the health sciences should guide investment in technologies. The weakness of private incentives to research toxicity, combined with secretive behavior, may lower the general level of safety in the industry.[180] Indeed, the expectation of a legal shield from health research may affirmatively guide investments in the direction of secrecy. Steven Cheung has suggested that such an effect exists generally in R&D investment markets. While it is difficult to tell whether these costs may be occasional or routine, proprietary interest and interest in avoiding regulation may combine to produce pockets of costs that are not readily apparent, even to regulators. The actual number of trade secrets claimed need not be large for the opportunity costs of trade secrecy to be significant.[181] The direction and cost of the public project of choosing and guiding technology may be affected.[182]

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178. *See* Lyndon, *supra* note 106; NATIONAL ACADEMY OF SCIENCES, DECISION MAKING FOR REGULATING CHEMICALS IN THE ENVIRONMENT 33 (1975).

179. Spence, *supra* note 5.

180. *See* Akerlof, *supra* note 5 (discussing implications of buyers' limited ability to judge the quality of products of varying grades); *see also* Lyndon, *supra* note 106.

181. Figures on the number of trade secrets claimed vary widely. A 1975 NIOSH survey of

Outside the context of toxics regulation, there are other opportunity costs related to concerns about respecting proprietary interests in information. Secrecy hampers efforts to predict the side effects of emerging technologies and to guide incumbent technologies in new directions. Also, the use of market-based incentives in health, safety, and environmental regulation is compromised by legal protection for secrecy.

Environmental regulation has been largely ex post facto, but as we gain experience with patterns in technological evolution, the value of anticipating the effects of new technologies becomes apparent. The early phase of each major technology has been characterized both by great optimism and by difficulty in foreseeing its costly side effects. This cycle may be recurring with biotechnology.

Innovation in biotechnology is influenced by a variety of factors,[183] but industry proponents have been successful in arguing that the "fledgling" technology should be left largely unregulated, at least for the time being. Instead of being the subject of direct and focused regulatory attention, the varied uses of bioengineering are covered by existing provisions in numerous federal statutes, administered by a handful of agencies.[184] There is widespread agreement that there is not enough data available today to assess the impacts of releases of bioengineered organisms on the environment.[185] The rules concerning disclosure are inconsistent because of the variety of statutes and agencies which cover biotechnology.[186] The development of a coherent anticipatory research program will be affected by secrecy and disclosure dynamics in this field.

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exposures in the workplace found that out of 85,000 trade name products included in the study, 5,760 of these had ingredients considered trade secrets by respondents; out of 427 products considered carcinogens, 151 were claimed trade secrets. Only 50 trade secret claims were made in the EPCRA NTI inventory of 70,000 air emissions. Richard Grawey, in Toxic Substances and Trade Secrets, Report of the Technical Information Project of the Ethical and Value Implications of Science and Technology Program of the National Science Foundation 76-82 (1977); telephone conversation with Gerard Brown, Chief of Nonconfidential Information Service Section, EPA Office of Toxic Substances (Jan. 24, 1989). The discrepancy in the figures may be due to the focus on products in the first survey and on pollution in the second. Alternatively, the discrepancy may be due to the different procedural context—informal ex ante survey as opposed to legally mandated reporting to an agency with substantiation required.

182. To the extent that agencies respect confidentiality claims, they must conduct the public's business in secret; however, to the extent that firms do not expect their confidentiality interests to be respected, they will not be forthcoming with the government. *See* Kitch, *supra* note 36, at 695.

183. Adler identifies a range of factors influencing growth in the biotechnology industry. *See* Reid Adler, *Biotechnology Development and Transfer: Recommendations for an Integrated Policy*, 11 RUTGERS COMPUTER & TECH. L.J. 469 (1985).

184. *See* Sydney A. Shapiro, *Biotechnology and the Design of Regulation*, 17 ECOLOGY L.Q. 1, 15-26 (1990).

185. The available data are inadequate to allow assessment of the dangers of many products. For procedural problems in gaining access to such data, see Jane Rissler & Margaret Mellon, *Public Access to Biotechnology Applications*, 4 NAT. RESOURCES & ENV'T. 29 (1991). For examples of conflicting risk estimates, see Shapiro, *supra* note 184, at 11-12. Shapiro describes different views on the hazards of release of genetically engineered organisms into the environment. *Id.* Unfinished Business: A Comparative Assessment of Environmental Problems, U.S. EPA (Feb. 1987), repeatedly points to lack of information as a difficulty in evaluating appropriate regulatory action. Volume I, at 34 (biotechnology), 35, 38, discusses the risks of chemical exposures. Exposure data is especially weak. *Id.* at 35, 38, 57, 87, 98.

186. Shapiro, *supra* note 184.

Claims to secrecy also block attempts to redirect technologies which have rigidified in dysfunctional patterns. End-of-pipe approaches to pollution control are environmentally inferior to more basic redesign of production systems. Waste reduction, or dematerialization, favors industrial technologies which utilize fewer extracted materials, create less waste, and facilitate recycling. Waste reduction can be accomplished in part by finding substitutes for certain broad classes of widely used materials.[187] In order to prevent waste creation by substituting products and processes, key industries must also re-engineer some of their operations.[188] Waste reduction advocates argue that, in doing so, firms can increase their competitiveness, decrease the costs of complying with and enforcing environmental regulations, and lower health risks.[189]

There are a number of policy options available to encourage dematerialization, including a variety of information-based approaches.[190] Several bills now in Congress would establish design institutes and federal agencies could develop rating systems.[191] A 1986 report of the Office of Technology Assessment ("OTA") suggests that information transfer is a central function of any program to assist in waste reduction,[192] and the EPA has plans to establish an information clearinghouse that could produce and transfer information about product design changes and chemical substitutes across products and industries.[193] These projects are likely to be inhibited by concern that they must not violate proprietary information claims. Industry is likely to object to close scrutiny of processes, inputs, and product design. The OTA has recommended procedures for waste reduction at the plant level and believes that these could be handled so as to avoid revealing firms' proprietary information;[194] however, even if this were the case, it would not solve the problem. A proprietary design or process that does reduce waste is also likely to lower manufacturing costs. Information that reduces costs, including pollution costs, will have proprietary value for that reason alone. Market

187. Jesse H. Ausubel et al., *Technology and Environment: An Overview, in* TECHNOLOGY AND ENVIRONMENT 11-12 (Jesse H. Ausubel & Hady E. Sladovitch eds., 1989).

188. Kirsten U. Oldenburg & Joel S. Hirshorn, *Waste Reduction: A New Strategy To Avoid Pollution*, ENV'T., Mar. 1987, at 16-45. Companies are now organized to treat pollution and production as entirely separate matters. *Id.* In addition, firms often lack basic information about their waste streams; they commonly do not charge waste-management costs to individual production lines. Waste management requires the participation of all phases of production, not just environmental engineers. *Id.* at 42.

189. Nicholas A. Ashford et al., *Using Regulation to Change the Market for Innovation*, 9 HARV. ENVTL. L. REV. 419 (1985); Nicholas A. Ashford & George R. Heaton, Jr., *Regulation and Technological Innovation in the Chemical Industry*, 46 LAW & CONTEMP. PROBS. 109 (Summer 1983).

190. Howard Levenson, *Wasting Away: Policies to Reduce Trash Toxicity and Quantity*, ENV'T., Mar. 1992, at 32. These include establishing clear goals; providing incentives with grants or preferred status for government procurement; improving the flow of information through labelling, education, and clearinghouse services; establishing a system of waste audits; and banning or placing fees on specific products or substances. *Id.*

191. *Id.* at 11.

192. *See* Oldenburg et al., *supra* note 188, at 40-42.

193. Levenson, *supra* note 189, at 34-35.

194. Oldenburg et al., *supra* note 188, at 39.

incentives will discourage sharing of environmental information that would be useful to rivals.[195]

This suggests a third type of dysfunction inherent in the legal option to keep environmentally useful information secret. Advocates of the use of property rights in pollution control point out that entitlements to pollute should create incentives to increase the exchange value of the rights through decreasing the owner's consumption of them.[196] Marketable permits to pollute will also increase incentives to keep secret any techniques that reduce pollution, where rivals may benefit. Given the social value of diffusion of information that reduces environmental and medical externalities, should the law support a polluter's entitlement to keep it secret? What effects might an option of secrecy have on the development of pollution control technology and the emerging system of environmental auditing requirements?

The economic case for protecting secrecy of health and environmental information is weakened when the opportunity costs are considered. Indeed, there is a strong case for abandoning any effort to protect secrecy in this context. This analysis has not subjected the trade secrecy claim to the tests of jurisprudence. What might legal theorists contribute to a resolution of the conflicting claims to this data?

III. TRADE SECRECY AS AN ENTITLEMENT

Academic commentary on intellectual property law has tended to give short shrift to trade secrecy.[197] When it has been addressed, approaches have varied widely. For instance, Richard Posner sees trade secret law not as property, but as a branch of unfair competition. He also likens it to privacy law, calling it "corporate privacy." He sees it as providing incentives to invest in information production and reducing the need to

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195. Levenson, *supra* note 190, at 13.

196. *See, e.g.*, Richard Stewart & Bruce Ackerman, Comment, *Reforming Environmental Law*, 37 STAN. L. REV. 1333 (1985).

197. *See, e.g.*, Frank H. Easterbrook, *Intellectual Property is Still Property*, 13 HARV. J. L. & PUB. POLICY 108 (1990). Hughes includes trade secrets in his analysis. Justin Hughes, *The Philosophy of Intellectual Property*, 77 GEO L.J. 287 (1988). Like many writers commenting on intellectual property, however, he does not fully recognize the idiosyncracies of trade secrets which distinguish them from other entitlements to knowledge. He finds intellectual property more egalitarian than other property, because its limited scope and duration prevent accumulation. *Id.* at 291. He suggests that the greatest difference between intellectual property and other entitlements is their built-in expiration. He treats trade secrets as simply expiring at some point when guard is let down, but this fails to account for the effects of the period of secrecy itself, which actually may be quite extended. Similarly, he argues that protectable ideas are unique, but trade secrets need not be. *Id.* at 322. Also, intellectual property is in the public domain; he says that one can not imagine an intellectual property system that completely excludes other uses. *Id.* at 317. While patents fit this description, trade secrets do not. Indeed, trade secrecy aims to do just that. The jurisprudence of secrecy therefore must be fundamentally different from that of the mainstream of intellectual property. Hughes' point is important to the theory of secrecy, however. Access is the fundamental value which limits entitlements to intellectual property and it should inform the law's treatment of secrets.

guard against theft of information.[198] Kim Scheppele agrees that trade secrecy is like privacy, but argues that courts should protect investment instrumentally, in order to support the relationship between the parties.[199] Edmund Kitch suggests that the emphasis on the relationship of trust between managers and other firm employees in trade secret law is designed to preserve the institutional integrity of the firm and allow an accounting of information stock.[200] Steven Cheung maintains that property rights cannot be articulated without destroying the secret and therefore finds the law of contracts central here, since research in progress relies on enforcement of confidential relationships through contract.[201] Other writers attempt an integration of the different approaches.[202]

The notion of secrecy as a property entitlement is not well developed in the theoretical literature. However, in *Ruckelshaus v. Monsanto*, the Supreme Court characterized trade secrecy as an interest in the nature of property, to the extent that state common law so holds.[203] The decision was regarded by some as a turning point in trade secret law, an endorsement of the claim that trade secrets, even in the regulatory context, are "property" in the strong sense of the term.[204] If the law calls an entitlement "property," it receives greater deference in practice than do other entitlements.[205] The EPA's interpretation of EPCRA's disclosure requirements is a case in point. In *Ruckelshaus*, however, the Court did not actually examine whether state common law generally does protect secrecy of health, safety and environmental information, and its analysis

198. *See* POSNER, THE ECONOMICS OF JUSTICE, *supra* note 2, at 241; POSNER, ECONOMIC ANALYSIS OF LAW, *supra* note 2, at 40-41; Friedman et al., *supra* note 2. Where information is not the result of a significant investment, Posner finds the case for protection weakened. POSNER, THE ECONOMICS OF JUSTICE, *supra* note 2, at 242-44. Anthony Kronman has argued that in contract cases, courts distinguish between information acquired as a result of effort and that acquired casually, and that courts do not look at the particular information, but the type, as it would be costly for courts to evaluate the information as such. Anthony T. Kronman, *Mistake, Disclosure, Information, and the Law of Contracts*, 7 J. LEGAL STUDIES 1-33 (1978).

199. SCHEPPELE, *supra* note 2, at 254 (1988).

200. Kitch, *supra* note 36, at 701-04.

201. Cheung, *supra* note 52, at 47-49.

202. *See e.g.*, Daniel J. Fiorino, *Environmental Risk and Democratic Process: A Critical Review*, 14 COLUM. J. ENVTL. L. 501 (1989) (the law operates at three levels—(1) presumed confidentiality as in professional relationships, (2) agreements regarding confidentiality and (3) limits on dissemination, which are only imposed for good reason, as for value of the information in one use as opposed to another).

203. *Ruckelshaus*, 467 U.S. at 1001 (citing Board of Regents v. Roth, 408 U.S. 564, *aff'd*, Perry v. Sindermann, 408 U.S. 593 (1972)). If the common law would not provide trade secret protection to health and safety information, how valid are federal statutes that purport to do so by incorporating the common law by reference? Do trade secret provisions in state right-to-know laws change state common law? One court says no. *See* New Jersey Chamber of Commerce v. Hughey, 600 F. Supp 606, 627 (D.N.J. 1985), *aff'd*, 774 F.2d 587 (3d Cir. 1985).

204. MILGRIM, *supra* note 30.

205. *See* Waldron, *supra* note 30, at 313 (property gives such strong entitlements that overbroad claims are made). Michelman finds that property in constitutional law is primarily understood as an antidistributive principle. Frank I. Michelman, *Property, Utility and Fairness: Comments On The Ethical Foundations of "Just Compensation" Law*, 80 HARV. L. REV. 1165 (1967). As such, it is a claim for incumbency; this in itself raises questions when the subject is a polluting technology. *Id.*

of Missouri's law, which applied in that case, was cursory.[206] There was no need to focus on the issue, because the EPA stipulated on this point.[207]

Exploring the theoretical arguments for regarding health and environmental data as property is hardly a straightforward project. Jeremy Paul has provided a useful framework for understanding the shifting, even circular, nature of property jurisprudence.[208] He suggests that courts use two distinct kinds of reasoning when resolving property disputes. One approach refers to existing social practice with respect to specific resources and adopts this custom as the basis of property entitlements. The other attempts to define clear entitlements which will provide a stable context for the purchase and use of resources. The two models are mixed in practice; indeed, they seem to behave symbiotically.

Both approaches are evident in the debate over disclosure of health and safety data. There seems to be little intuitive basis for trade secret protection when we focus on the fact of a chemical exposure of a human body and the need for medical diagnosis and research. Social practice would clearly reject secrecy when the case is put this way. The arguments for secrecy are made in the contrasting mode: purchasers' investments require the expectation of control of information related to the production process, and producers are therefore justified in this expectation. The two ways of thinking about the problem seem hopelessly opposed.

Nonetheless, it may be useful to apply the standard property tests to this particular claim of entitlement. Property entitlements are generally thought to serve several purposes. They protect the acquisitive faculties which bring wealth, and they strengthen and protect the citizen independence and participation which enhance the community.[209] Secrecy of health and environmental information undermines both goals. It seems that neither efficiency nor fairness support a property claim to exposure information.

The most common economic arguments for trade secrecy are based upon the reward approach to intellectual property law. For instance, Posner and Anthony Kronman see privacy and trade secrecy based upon appropriability and reward reasoning.[210] As we have seen, however, this

206. *See* Samuelson, *supra* note 126.

207. *Id.*

208. Jeremy Paul, *The Hidden Structure of Takings Law*, 94 S. CAL. LAW REV. 1393 (1991).

209. Stephen J. Massey, *Justice Rehnquist's Theory of Property*, 93 YALE L.J. 541 (1984); *see also* C. Edwin Baker, *Property and Its Relation to Constitutionally Protected Liberty*, 134 U. PA. L. REV. 741, 744-55 (1986). Property analyses tend to interweave a handful of related concepts giving more or less emphasis to central ones, such as firm expectations, autonomy, and wealth production. The utilitarian property rights clarify and secure expectations concerning access to resources in order to maximize overall material welfare; a clear legal framework of entitlements should encourage efficient development and exchange of goods. Entitlements can also be set according to principles of fairness or justice. Some sense of individual rights to autonomy and freedom, both from interference and to acquire goods, are part of rationales based either on utilitarian or fairness principles.

210. *See supra* note 198. Kronman's description of the courts' protection for information as the fruit of investment is based upon concern for appropriability. However, since the value of information is not a function of the level of R&D expenditures, and since imitation may be very productive

model does not reflect the complexities of the innovation process. Moreover, discussing privacy, Posner finds no good reason to give people property rights in negative information about themselves. He does not address the possibility of a conflict between the two, a situation in which useful, but "negative" information is the result of an investment.[211]

In *Ruckelshaus v. Monsanto*, the court found that Monsanto had "a reasonable investment-backed expectation" that the agency would protect the confidentiality of its health and safety studies. That expectation was linked specifically to the provisions of FIFRA, however, and the court suggested that absent such assurances a firm should not expect to keep confidential data which are used for health and safety regulations.[212] Is this suggestion well founded? Can trade secrecy entitlements be defended as insurance against encroachment on legitimate expectations?[213] Does the law foster an expectation of freedom to create health and environmental risks without allowing independent examination of them?[214] The decision in *Ruckelshaus* suggests it does not, as does the rule that regulation to abate a nuisance is not a taking.[215]

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and duplicative investments wasteful, the rule only works at its most general level, that is, that courts protect "types" of information "deliberately acquired."

211. POSNER, THE ECONOMICS OF JUSTICE, *supra* note 2, at 233; *see* discussion of privacy and trade secrecy, *infra*. In Posner's analysis, information has the capacity for only one meaning. Scheppele points out that Chicago School microeconomics ignores the larger lesson of information economics, that is, that the uses of information are many and pervasive throughout the economy; thus disclosure may increase the efficiency of many decisions. SCHEPPELE, *supra* note 2, at 35, 165, 251-53.

Like Posner, Scheppele argues that investment is the hallmark of trade secrecy, though she sees the function of investment differently. In her view, courts follow an essentially contractarian approach to disputes about disclosure and are concerned to make the starting point equal for the parties, in both individual and "corporate privacy." She suggests that in the commercial context information is equally accessible to the two parties in the dispute, as the costs of making technological advances are likely to be roughly equal for different firms. Thus, courts look to the plaintiff's investment as evidence that the other could also invest. If no investment is made, she says, then the knowledge must be obvious and therefore not a secret. *Id.* at 260.

Courts do say this sometimes, but it is a fallacy based on hindsight. Nelson and Winter point out that we often think of knowledge as abstract, picked out of the air, but by definition firms do start in different places and have different costs. Also, unlike the patent system, trade secrecy does not make obviousness a test for recovery; obviousness has little meaning in the topographical model. Investment is relevant, but courts generally consider it at the remedy stage, not as an element of the cause of action. This makes sense, since the law intends to encourage investment, but the value of information and the level of investment may be only loosely related. If investment were the primary criterion for protection, the law would encourage everyone to invest in signalling investments, causing waste in addition to common pool duplication. So the law makes this deal: if you produce scarce data of any value, at whatever cost, you can keep it secret if you make a credible effort to do so.

212. Ruckelshaus v. Monsanto, 467 U.S. 986, 1010 (1984).

213. *See* STEPHEN R. MUNZER, A THEORY OF PROPERTY 79-80 (1990); Michelman, *supra* note 102; Duncan Kennedy & Frank I. Michelman, *Are Property and Contract Efficient?*, 8 HOFSTRA L. REV. 711, 712-26 (1980) (pointing out that one person's certainty may be another's uncertainty).

214. *See* Ruckelshaus v. Monsanto, 467 U.S. 986 (1984). Utilitarian property theory, though it emphasizes security of expectations, holds that compensation need not be paid for takings when an investment was made which interrupted someone else's enjoyment of a good, where this should have been apparent, or where society has adequately made it known that the investment should not be the object of expectations of continuing enjoyment. Michelman, *supra* note 106, at 1241.

215. *See* Paul, *supra* note 208; Carol Rose, *Mahon Reconstructed: Why The Takings Issue is Still A Muddle*, 57 S. CAL. L. REV. 561, 582 (1984). Richard A. Epstein, *Takings: Private Property*

Broader efficiency arguments for trade secrecy are also problematic. Property rights theorists would allocate entitlements based on measures of economic productivity, starting from the hypothesis that control over scarce resources is necessary to identify and achieve their best use.[216] Secretive behavior, however, does not prevent misuse or overconsumption of information; rather, it seems to compound inefficiencies, and secrecy about externalities seems by definition to be overconsumption. Legal protection for secretive behavior may be justified, as Posner suggests, by a showing that it actually reduces such behavior. However, this argument, which is both appealing and counter-intuitive, falls short of being a convincing general rationale for trade secret law.[217] In any event, it does not apply to specific protections for exposure data. There is no reason to expect that a trade secret exemption to disclosure rules will lead firms to reveal more data than the rule already requires.

Harold Demsetz suggests that property rights emerge from new forms of specialization and that they survive to the extent they assist in internalizing new technologies' externalities. In this view, the long-term viability of new property rights depends on how well they influence behavior to accommodate to the externalities associated with important changes in technology or market values.[218] Demsetz's approach gives property rules a role in integrating new technologies with social practice, but it also takes technologies as given, externalities and all. Property rights themselves influence the innovation process and the investment choices which channel technical options into specific externality patterns. The question for law-

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and the Power of Eminent Domain (1985) [as per Thomas W. Merrill review at 80 Nw. U. L. Rev. 1561, 1573 (1986)] suggests that where economic theory tells us that there is a common pool or collective action problem, legislation to overcome the problem should be read as providing implicit compensation. Munzer, *infra* note 213, ch. 15. Nuisance regulation is not a taking. *See* Michelman, *supra* note 106, at 1196-1201, 1236 (expressing reservations: the rule has strong intuitive appeal, but harm-prevention and benefit-extraction distinctions in takings have limited analytical adequacy if the balancing is grounded in efficiency considerations).

216. Property rights arguments start from resource scarcity, but this is problematic when applied to knowledge. Knowledge is not unlimited, as some suggest. *See, e.g.*, Hughes, *supra* note 197. Knowledge in the abstract seems not to be limited by the possibility of exhaustion, but the extent or content of actual knowledge may be limited by human nature, by cultural framework, or by topographical context. Kitch points out that the resources available to produce information are limited. Yet, limits on the investment of resources and limits on the possible knowledge product itself are distinct; secrecy limits both.

217. *See* discussion, *supra* notes 81-83 and accompanying text.

218. Property rights should guide incentives to achieve greater internalization of externalities. Harold Demsetz, *Toward A Theory of Property Rights*, 57 Am. Econ. Rev. Papers & Proceedings 347, 348-52 (1967). Perhaps the very concept of an externality becomes overbroad when applied to something as fluid as information, but Demsetz applies his model to informational externalities. *Id.* at 359. If we define an externality as something which cannot be the subject of a transaction (cannot be internalized in the market process) or as a harm or benefit to third parties whose costs to transact concerning the effect are greater than the gains from internalization, secrecy entitlements to pollution data do not internalize. Trade secret entitlements in general are weak protection against "free riders" and compound the costs of negative externalities when the secret concerns an exposure. The "owner" has no incentive to disclose to someone who is not a potential licensee, who would also keep it secret. Coordination costs, free riders, and lack of funds prevent purchase by the exposed and by researchers. Further, secrecy will pose a threshold barrier to demand where the fact of the exposure or its link to an injury is not readily apparent.

makers is who shall accommodate whom?[219] A technology built on costly externalities will surely claim new entitlements, but these may still be wasteful or unfair.[220]

Are the fairness arguments for trade secrecy of environmental data stronger than its efficiency claims? While one is entitled to the fruits of one's labors, one is not entitled to injure others with them.[221] In any event, knowledge, even more than other "fruits," results from cooperative enterprise; indeed, much of the science underlying some of today's technologies has been funded by public monies.[222] Individuals' or firms' claims to deserve exclusive control over these for their own benefit may be excessive.[223] Wendy Gordon has pointed out that the "free rider" or unjust enrichment basis for granting an entitlement to intangibles tends to expand beyond the economic and moral boundaries which seem justified.[224]

First possession is also a weak basis for secrecy claims.[225] Two interests may be posited as the subject possession—the exposure information or

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219. *Id.* at 350. Demsetz illustrates his discussion with examples from Native American history; Carol Rose uses frontier homesteaders. More complex subject matter reveals important factors at play. *See* Paul, *supra* note 208, at 1423-25; William H. Riker & Itai Sened, *A Political Theory of the Origin of Property Rights: Airport Slots* (Nov. 1990) (unpublished paper presented at Columbia University Legal Theory Workshop; on file with the *New Mexico Law Review*). Demsetz' model does not address the political dimension, but this results in a treatment that is ahistorical and abstract. It also allows for extrapolations that would not be justified from richer descriptions. *See* Gregory S. Alexander, *History vs. Ideology in the Basic Property Course*, 36 J. LEGAL EDUC. 381 (1986). The problem and literature related to it are discussed in GARY D. LIBECAP, CONTRACTING FOR PROPERTY RIGHTS 16-69 (1989).

220. One can view the history of applied chemistry as an illustration of a dynamic of expanding legal claims to resources. The growth of the chemical industry in the period following World War II took place in a virtual air and water commons and, at least initially, low pressure on land resources. Industry invested in plants designed to use these resources and implicitly made claims to the use of air, water, soil, plants, and human and animal bodies for waste disposal. These claims have the presumption of validity under current statutes, because OSHA and EPA must find that exposure causes environmental harm or health risks before it must be curtailed. Widespread use of chemicals spurred related study: epidemiology, toxicology, and the new technologies of chemical measurement extended the territory in contention by revealing the pervasiveness of chemical dispersion. Computers and electronic communications, which increase the capacity to use information, developed in the same period. State right-to-know laws then codified the claims of those exposed and, in response, trade secret claims were expanded to the identity of exposure in OSHA's hazard communication rulemaking and to health effects data in the EPA's NTI proceeding. Right-to-know and notice laws continue to expand and, in turn, broader privilege claims are being made.

221. ROBERT NOZICK, ANARCHY, STATE AND UTOPIA 29-35 (1974) (discussing Locke, moral constraints, aggression, and the Kantian principle that individuals are ends and not means); BOK, *supra* note 2, at 142-44, 148-50 (on Locke's proviso that one must leave "enough and as good" for others); Rose, *supra* note 213. *See generally* WEIL & SNAPPER, *supra* note 53.

222. This is most clearly the case with biotechnology. *See* Nelkin & Brown, *supra* note 175, at 24-25 (discussing private research dollars yielding considerable profits when applied to basic knowledge developed at public expense).

223. Munzer discusses work as a social enterprise and examines the limits this places on claims for property. MUNZER, *supra* note 213, at 280.

224. Wendy Gordon, *On Owning Information: Intellectual Property and the Restitutionary Impulse*, 78 VA. L. REV. 149 (1992).

225. Richard Epstein advocates first possession as a basis because he finds that it is intuitively right, simple, and efficient in the sense that it gets the property system going. But he also recognizes the roles of adverse possession and notice, which prevent waste and accommodate the need to protect strangers to the title. Richard Epstein, *Past and Future: The Temporal Dimension in the*

the body which is exposed. A claim to control exposure data extinguishes the claim to control the body.[226]

Personal autonomy is an elemental legal concept which logically precedes arguments for entitlements, though its definition and scope are debated.[227] The simple fact of exposure to pollutants, absent any secrecy, raises difficult autonomy problems. It seems that under any conception of autonomy, withholding information about potentially harmful exposures would be invalid. The opportunity to know about exposures is central to choices about survival. Consent to bear the risks of an exposure is distinct from consent to prevent oneself or others from ameliorating its effects. Secrecy imposes helplessness on the exposed person. Legalizing secret exposures also immunizes the polluter from liability. Legal protection of secret exposures is neither fair nor efficient, but rather a form of "total risk bearing," in Dean Calabresi's words.[228]

Even if secrecy of exposures cannot be defended based on these standard tests, it might still be chosen as the preferable rule if it were seen as generally more productive than disclosure. One could try to compute the value of the two alternative entitlement schemes. Unfortunately, computing expected values, which is problematic in any case, is so complicated here that it is a very weak decision guide. The limited implications that can be drawn from it support disclosure rather than secrecy.

Measuring and balancing information entitlements in this context entails several basic problems. The familiar equity issues associated with cost-benefit analysis are exacerbated in the environmental context.[229] As a

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Law of Property, 64 WASH. U. L.Q. 667, 667-68 (1986). Carol Rose points out that the two principles of Pierson v. Post, 3 Cai. R. 175 (N.Y. 1805), are notice to the world and reward. Acts of appropriation are signalling devices, which have meaning only in the context of a recognizing community. When the law recognizes a claim, it puts its imprimatur on that meaning and those who do not recognize it are out of luck. Secrecy prevents these essential processes from occurring.

226. *See* Patricia Williams, *Fetal Fictions: An Exploration of Property Archetypes in Racial and Gendered Contexts*, 42 FLA. L. REV. 81 (1990). The claim of entitlement to be free from liability, in spite of causing an exposure, is a property claim to the body of the one exposed. *Id.* See Paul, *supra* note 208, at 1418-23, on the conundrums of "physicalist" property arguments, which must select which social practice to adopt when two customs or view of resource use conflict.

227. Margaret Jane Radin, *Market—Inalienability*, 100 HARV. L. REV. 1849 (1987); Margaret Jane Radin, *Property and Personhood*, 34 STANFORD L. REV. 957 (1982). Property may be justified as a means to control over one's body a right to basic nourishment and the means to develop the human personality. *Id.* The economist's self-interested, utility maximizing actor also works from a base of informed autonomy, necessary to participate in the market. *Cf.* Jules L. Coleman & Jody Kraus, *Rethinking The Theory of Legal Rights*, 95 YALE L.J. 1335 (1986); *see* SCHEPPELE, *supra* note 2, at 60-66 (on consent as a basis for legal morality).

228. Guido Calabresi, *Torts—The Law of the Mixed Society*, 56 TEX. L. REV. 519, 525 (1978). Secrecy creates a feeling of exclusion. Here, it also fosters a sense of helplessness in the face of an injury, compounded by a sense of waste, since someone knows something that might help, and of anger, as someone is profiting while the exposed is in peril. This is not imagined, especially in the worker's case; the information asymmetry is compounded by an economic and power asymmetry. Autonomy can give way to distortion, disfigurement, and destruction of the person. *Id.*; *see* Williams, *supra* note 226 (citing data on large numbers of Brazilian women having themselves sterilized to keep jobs which entail chemical risks).

229. *See* Michael S. Baram, *Cost-Benefit Analysis: An Inadequate Basis for Health, Safety and Environmental Regulatory Decisionmaking*, 8 ECOLOGY L.Q. 473 (1980); Thomas O. McGarity, *Substantive and Procedural Discretion in Administrative Resolution of Science Policy Questions:*

practical matter, the basic data necessary to do an analysis frequently do not exist. Even where basic data are available, measuring and comparing the future values of different types of knowledge is a very uncertain exercise. Cost-benefit analysis assumes that one can identify and price all of the relevant costs and benefits to be weighed and predict these values over time. For instance, the context of future usage must be understood and surrogate prices must be developed, as there are no established market prices.[230] Estimating the costs of environmental injuries, particularly those with long term latencies, is difficult,[231] and identifying and valuing technological innovation is no easier.[232] Figuring out the costs of the research necessary to identify the injuries and achieve the innovations is even more uncertain. Balancing the two is a meaningless exercise.

There is a more fundamental problem. Cost-benefit analysis is designed to assist selection between alternative projected outcomes. It uses a probabilistic approach to structuring the situation, which may solve some of the uncertainty problems posed by the decision;[233] however, it does not solve a crucial difficulty present here. The subjective assessment inherent in probabilistic extrapolations is limited by present knowledge.[234] Future knowledge cannot be predicted based on extrapolation from what we know now without ignoring some basic dynamics of learning, including

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Regulating Carcinogens in EPA and OSHA, 67 GEO. L.J. 729 (1979); William H. Rodgers, Jr., *Benefits, Costs, and Risks: Oversight of Health and Environmental Decisionmaking*, 4 HARV. ENVTL. L. REV. 191 (1980) (analysis of the specific issues in the environmental context).

230. Dasgupta notes that the environmental impact of current production and consumption activities take place in the future; without an adequate set of forward-looking risk data, recourse to direct curtailment of certain types of consumption and limiting the use of some production processes may be necessary. PARTHA DASGUPTA, THE CONTROL OF RESOURCES 11 (1982).

231. Harvey Brooks, *The Typology of Surprises in Technology, Institutions, and Development*, *in* SUSTAINABLE DEVELOPMENT OF THE BIOSPHERE, 331-32, 335-39 (1986); FREDERICK R. ANDERSON ET AL., ENVIRONMENTAL PROTECTION: LAW AND POLICY, 43-44, 593-603, 869-71 (1990); Rodgers, *supra* note 229. Anderson, Mandelker, and Tarlock discuss the difficulties of making an inventory of all relevant costs and benefits and the resulting temptation to exclude "remote" effects. ANDERSON ET. AL, *supra*, at 597. In addition, they discuss, the selection of an appropriate discount rate. Relatively high discount rates (around 10%) are applied to the potential costs of leaving hazardous chemicals unregulated. *Id.* at 599-600. Injuries may not be realized for many years. The National Academy of Science has pointed out that, if the discount rate were 5%, one toxic poisoning case in 1975 would be valued the same as 1,733 cases in 200 years, or the same as the world population in 450 years. NATIONAL ACADEMY OF SCIENCE, DECISION MAKING FOR REGULATING CHEMICALS IN THE ENVIRONMENT 43 (1975). Discounting future injuries allows an increase in present actual welfare. Future injuries are uncertain, but how can the living strike an appropriate bargain with future generations? *Id.* (citing JOHN RAWLS, A THEORY OF JUSTICE 284 (1970)).

232. George Priest suggests that it is not possible for economists to answer basic questions about the value of commercial innovation. Economists can tell whether a rule will lead to more or less innovation, but the social value of that innovation is not susceptible to measurement. Priest, *supra* note 72.

233. Robert W. Kates, *Success, Strain, and Surprise*, *in* 2 ISSUES IN SCIENCE & TECHNOLOGY 46 (1985).

234. Mario J. Rizzo, *Law Amid Flux: The Economics of Negligence and Strict Liability in Tort*, 9 J. LEGAL STUD. 291 (1980) (citing generally, in note 58, G.L.S. SHACKLE, DECISION, ORDER, AND TIME IN HUMAN AFFAIRS 47-113 (1961), for proposition that the application of probabilistic methods assumes that all of the possibilities are known beforehand). Rizzo states that, "Technological change . . . essentially involves unknown possibilities. Novel ideas or genuine surprises are not possibilities over which a probability distribution can be drawn: the sample space is incomplete and incompletable." *Id.* at 308.

the possibility of surprise.[235] Assigning a value to present knowledge and then awarding a secrecy entitlement to it closes off opportunities to learn about the technology's effects. Thus, one is not simply discounting known risks, but also agreeing to ignore unknown risks. To allow secrecy as a support for appropriability is to accept the product without the opportunity to study its effects. It seems clear that the opportunity to examine risks and externalities is a significant value. Innovation stripped of knowledge about its side effects will have higher overall costs than innovation accompanied by learning about it.

Calabresi's and A. Douglas Melamed's framework accommodates both property and liability considerations in a model that fits the topographical notion of learning. They recommend property rules where there is sufficient information to allocate resources to the most productive use and, where there is uncertainty, a series of steps for assigning liability to the cheapest briber, the party positioned to make the best of existing information.[236] Similarly, Kitch explains patents as essentially placing a property entitlement in the hands of the cheapest learner.[237] The patent gives control of the research prospect to the one who has proven her ability to learn; at the same time, it issues notice to other interested parties who also have expertise, so they are in a position to deal. This is the basic principle on which the law should build.

Unfortunately, no single firm or individual is well situated to develop both technological knowledge and a full understanding of its effects.[238] If we had to choose one, the "best" learner might still be the manufacturer, since the polluter does have a good part of the relevant information and commercial enterprises generate financial resources which can be applied to research. Firms could also avoid pollution costs by reducing or eliminating exposures. The problem is that the trade secret holder is somewhat disabled when it comes to studying the effects of a technology. A producing firm is not especially well situated to gather dispersed epidemiological and ecological data or to criticize its own

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235. The term "surprise" is used in two senses. Information theorists use it as a measure of the information content of a message, defined in terms how much "news" it brings. Shannon & Weaver, *The Mathematical Theory of Communication* (1949), described by W. KINGSTON, INNOVATION, CREATIVITY AND LAW 106 (1990). Brooks, *supra* note 231, at 326-32, uses it in the sense of new connections becoming apparent as we explore terrain. We know some of what is there, but are limited by our position.

236. Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089, 1096 (1972); *see* Ellickson, *supra* note 175, at 722-24.

237. Kitch, *supra* note 40.

238. The assumption of the property rights school that individual, centralized control over resources will maximize resource use is not correct with knowledge. Kitch suggests that the best use of resources can be made by the individual, because of transaction costs, but where there are externalities that require the attention of separate scientific disciplines, the firm is not in the best position to address them. Kitch's analogy to mining explains patent law well, but he does not integrate FOIA and restrictive covenant rules because he does not recognize the multiple meanings of information. Knowledge is more flexible than minerals. Technical knowledge has positive externalities for neighboring industries and for disciplines outside the market of the inventor.

production processes.[239] Data must be shared if we are to produce the complex knowledge we need.

The arguments for treating trade secrets as property are unsatisfying because they are poorly adapted to the subject matter, which is withholding information in conditions of uncertainty about third party injuries. It is disclosure—a form of exchange and cooperation—which is both customary and familiar in the law.[240] The law of informed consent, particularly in the context of medical experiments using humans, is the strongest articulation of this theme.[241] Statutory information entitlements, such as right-to-know laws, have elaborated on the common law. Secrecy as a defense to a liability claim for failure to warn and secret nuisances are contradictions in common law terms.[242] Secrecy is a form of behavior which the liability system normally does not contemplate, except as strategic behavior.[243] It may be a species of strategic behavior or create opportunities for it.[244] Neither regulators nor courts are well positioned to correct these failures.[245]

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239. Michelman, *supra* note 106, at 684-85 (physical evidence is dispersed); *see* Howard A. Latin, *Environmental Deregulation and Consumer Decisionmaking Under Uncertainty*, 6 HARV. ENVTL. L. REV. 187, 218 (1982).

240. Custom is the usual basis for managing a commons. BONNIE J. MCCAY & JAMES M. ACHESON, THE QUESTION OF THE COMMONS: THE CULTURE AND ECOLOGY OF COMMUNAL RESOURCES (1987). It presupposes a populace that behaves according to customs of civic care. Rose, *supra* note 213, at 745-46. *Id.* There is a theme in property law which maintains that commerce socializes, by modifying the appetite for "more." Thus, property "depends on a web of respect, honor, and acceptance that somehow modifies the immediate appetite for 'more.'" Carol M. Rose, *"Enough, and as Good" of What?*, 81 NW. U. L. REV. 417, 439 (1987). Secrecy about exposures is the antithesis of this.

241. *See* Marjorie Maguire Shultz, *From Informed Consent to Patient Choice: A New Protected Interest*, 95 YALE L.J. 219 (1985) (in general on informed consent); Note, *Informed Consent and Dying Patient*, 83 YALE L.J. 1632 (1974); *see* FDA regulations on Protection of Human Subjects, 21 C.F.R. §§ 50 to 50.58 (1992). Section 50.25 details the elements of informed consent, including reasonably foreseeable risks. *See* discussion of subjects as free agents in PRESIDENT'S COMMISSION FOR THE STUDY OF ETHICAL PROBLEMS IN MEDICINE AND BIOMEDICAL AND BEHAVIORAL RESEARCH, COMPENSATING FOR RESEARCH INJURIES (1982), *reprinted in* JUDITH AREEN ET AL., LAW SCIENCE AND MEDICINE 903 (1984).

242. Warning and consent rules attempt to establish a connection between the parties ex ante. Warning gives the plaintiff the option of assuming or avoiding the contact. *See* Sanderson v. Upjohn, 578 F. Supp. 338, 340-41 (D. Mass. 1984). The question of the identity of the danger of the exposure rarely comes up ex post, but if the danger can only be avoided through knowing its identity, it logically follows that, ex ante, this is a necessary part of the warning. One basic reason for informed consent is to enable second opinions. The closest concept to the secret nuisance is the view of false imprisonment that the imprisonment of an unconscious person is not a tort. This presents a conundrum, as deterrence and impact seem to be ignored by this rule.

243. Mayer G. Freed & Daniel D. Polsby, *Race, Public Policy and Bob Jones University*, 1983 SUP. CT. REV. 1, 23-31 (1983). Freed and Polsby suggest that strategic behavior imposes two types of costs—immediate or individual and systemic. The latter may lead to the unravelling of the government policy sought to be avoided by the strategic behavior. Here these include the immediate costs associated with not knowing about any particular pollution externality and the systemic cost of undermining the regulatory project.

244. *Id.*; BOK, *supra* note 2. Secrecy which is economically legitimate may still create opportunities for illegitimate activities. In addition to outright deception, it allows manipulation of information and overbroad claims. STEVENSON, JR., *supra* note 2. Bok suggests that secrecy and the isolation from feedback that attends it can debilitate judgment. BOK, *supra* note 2, at 105-11. Stevenson analyzes "the urge for secrecy" in terms of the personal agendas of the principals in corporate dealings. STEVENSON, JR., *supra* note 2, at 51. Secrecy may grow by feeding on itself, developing

The common law recognizes a secrecy option in the privacy area and some scholars have linked commercial trade secrecy law to common law liability for invasion of personal privacy.[246] The two have the same basic structure of notice and publication. Notice of intent to keep a secret is necessary to create the duty to keep the confidence, and publication destroys the duty. Since pollution places the need for the information, though not the information itself, in the public realm, it is consistent with the logic of both areas of law to consider the discharge of pollution to be the equivalent of a publication.

Another link between privacy and trade secret law is the perception that both firms and individuals need to control some kinds of information in order to interact with peers.[247] Privacy and autonomy are dependent upon control over some types of information. As Sisella Bok stresses, however, it is important to distinguish privacy, which is a realm subject to protection, and secrecy, a behavior associated with guarding that realm. It is also important to distinguish between individual and collective secrecy.[248] The needs of firms and those of families, friends and acquaintances are quite different and operate in separate "economies." Firms generally are hierarchical and competitive, with control, profit, and utility the dominant values of the marketplace. Family and social relations are subject to less adversarial mores. The extent of the difference between business and social life is an interesting question, but there is no need to see them as the same.

It is the strength of Sheppele's analysis of privacy and secrecy that it is grounded in the social context and makes a place for discussion about different reasons for disclosure. In her model, people would choose a rule that requires disclosure of secrets that might cause great damage to others.[249] Her fundamental rule is, "Disclosure is required (or, put more straightforwardly, privacy is not allowed) when the information has been judged necessary for someone else to know in order to make decisions that she is entitled to make."[250]

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into a kind of black hole of information. *See* Kitch, *supra* note 36. *See also* the history of secrecy claims in toxics regulation described *supra* in section II and the discussion of knowledge production in section IV.

245. Secrecy is linked in our minds with deception for good reason. As Bok expresses it, "Lies are part of the arsenal used to guard and to invade secrecy; and secrecy allows lies to go undiscovered and to build up."

246. *See* POSNER, THE ECONOMICS OF JUSTICE, *supra* note 2; SCHEPPELE, *supra* note 2.

247. BOK, *supra* note 2; Scheppele, *supra* note 2 (regarding boundaries). Secrecy involves claims that invoke both identity and power. BOK, *supra* note 2; Scheppele, *supra* note 2, at 5. Tefft's book contains studies of secrecy as a behavior in groups as varied as the Ku Klux Klan and the Taos Pueblo leaders. *See* STANTON K. TEFFT, SECRECY—A CROSS CULTURAL PERSPECTIVE (1980).

248. BOK, *supra* note 2, at 13 n.29.

249. *Id.* Scheppele's discussion, like many, tends to assume that secrecy will cause damage and not the reverse. Scheppele, *supra* note 2.

250. Scheppele concludes that: (1) the law should always require disclosure of secrets that would seriously injure someone and disclosure of deep secrets, except when the stakes are small; and (2) serial, but shared, secrets should not be disclosed unilaterally, unless secrecy would cause great harm, on the theory that promises should be enforced. Scheppele does not try to structure a rule normatively to encourage people to make certain decisions. See SCHEPPELE, *supra* note 2, at 78, 83 (discussion of autonomy as the moral basis of the law).

If knowledge construction is a social project, this starting point makes sense. Since each actor begins at different places and with different materials, each makes a distinct and necessary contribution. Another way of viewing the problem is to think of the existing stock of knowledge as "the common of the known,"[251] upon which new understandings and ideas must build. We currently have a technological commons with no access restrictions,[252] but with legal protection for secrecy, which bars some uses of data which would help correct the negative effects of technologies; thus, we have a commons with inappropriate access rules. Access by those concerned with the impacts of technologies should be assured by establishing a basic rule of disclosure.[253]

IV. ALTERNATIVES

Suppose the present de facto presumption of legal priority for secrecy interests were reversed. Assuming the desirability of a rule of disclosure for all exposures, what would be the effect on the innovation process? How would this rule fit with current law? Could a new approach be tailored to accommodate both appropriability and disclosure needs?

Current disclosure rules fail to take account of the fact that secrecy functions as a resource in a privately controlled system of information exchange.[254] Adding new players with outside interests, such as scientists, workers, or neighbors dislocates the private market for data. Trade secret disclosure invoked by individuals triggers the positional anxiety of a firm, since disclosure may put it at a disadvantage with respect to its rivals. Setting disclosure standards based upon exposure will affect some firms more than others. In any event, it changes the information market and makes it less predictable, because this disclosure is not related to commercial value.[255] In regulatory and legislative settings, proponents of trade secrecy protection may not have been arguing for the importance of any

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251. *See* discussion by Winter in Weil & Snapper, *supra* note 53, at 44.

252. Nonlegal restrictions of course include the requirement of ownership of resources to finance research. *See* Mary Lyndon, *Risk Assessment, Risk Communication and Legitimacy: An Introduction to the Symposium*, 14 COLUM. J. ENVTL. L. 289 (1989).

253. Disclosure can be thought of as a limitation on alienability. Susan Rose-Ackerman has outlined efficiency rationales for inalienability rules as second-best responses to market failures due to externalities, imperfections in information, or difficulties in coordination. Susan Rose-Ackerman, *Inalienability and the Theory of Property Rights*, 85 COLUM. L. REV. 931, 938 (1985). Richard Epstein finds that overexploitation of a common pool justifies restraints on alienation. Epstein, *supra* note 225, at 667. Efficiency is served by alienation restrictions where a transaction causes significant externalities to third parties. Calabresi & Melamed, *supra* note 236, at 1111; SCHEPPELE, *supra* note 2, at 259, 263. There are plausible efficiency and rights arguments for making access inalienable. *See* Anthony Kronman, *Paternalism and the Law of Contracts*, 92 YALE L.J. 763 (1983) (suggesting that significant asymmetries in parties' access to information may make it efficient to make warranties nondisclaimable).

254. *See* STEVENSON, *supra* note 2, at 3150. He analyzes the dynamics of information use and gives examples of firms' sensitivity to relinquishing information to the government in industries where the principle mode of competition is competitive bidding. *Id.* at 34-35, 46-47.

255. *Id.* at 36-50 (concluding that increased information disclosure is not likely to decrease the effectiveness of market competition).

particular subjects or categories of intellectual property, but for incumbent positions in the information market.

Firms' expectations concerning secrecy options can be changed by changing the law.[256] Incentives could be shifted to encourage firms to invest in alternative technologies or appropriability supports, instead of the trappings of trade secrecy currently encouraged by the common law. There appear to be three basic alternatives. These are sketched briefly here, with many questions necessarily left for later consideration.

First, we could dispense with any secrecy protection in the exposure context. Much of the case law and the jurisprudential analysis in section III supports this approach, and it would be simple to administer. If the law explicitly required disclosure of chemical identity where an exposure occurs, each firm could choose between avoiding exposures or dealing with the certainty of disclosure by patenting or emphasizing other nonlegal appropriability strategies.[257] Because exposure comes late in the innovation process, there may be little effect on the actual process of R&D itself. In any event, R&D investments and business practices would develop around this rule. The path of development might be channelled away from exposures that need to be kept secret for appropriability reasons. In addition, development of other types of information would be encouraged by removing legal protection for secrecy. Cooperative research or even a market for health and safety studies might be encouraged, if it were clear that no advantage could be gained by keeping them secret.[258] The same might occur for waste reduction techniques and pollution control devices.

A second approach could be modeled on FIFRA. When there is a request for disclosure of exposure or health and safety information, the agency with jurisdiction in the substantive regulatory area could call in the firms interested in the technology information and require an arbitration on value and terms of use. There still would be valuing problems and opportunities for strategic behavior, but it would be better than the current disclosure system, as it would provide whatever discipline market rivalry might offer. The government could act as a referee, but would not be a broker, quality control agent, or record sanitizer.

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256. NELSON & WINTER, *supra* note 60. Nelson and Winter have modeled the innovation selection environment, identifying the elements which influence investment decisions, including regulatory influences on what is profitable and the interaction of business routines and innovation. *Id.* They stress the fact that firms are limited in their options to change based on past experience but that choice among the options is made according to the reward structure which the world presents. *Id.* at 128-36. They identify four elements which influence investment decisions: (1) the cost-benefit ratio of the innovation; (2) the consumer and regulatory influences on what is "profitable;" (3) the relationship between "profit" and the expansion or contraction of particular organizations or units; and (4) the mechanisms for learning about the successful innovations of other organizations and the nature of the mechanisms which facilitate or deter imitation. *Id.* at 229, 248, 250-63.

257. Professor Dreyfuss has noted that the option of truly secret behavior is effectively reduced or removed by regulatory supervision anyway. Conversation with Rochelle Dreyfuss, Professor, New York University School of Law (Dec. 1, 1992).

258. Lyndon, *supra* note 106 (regarding encouraging market for research on toxicity).

A third option would be to provide alternative patent protection. This would have to be explored more fully than is possible here; the industries involved could no doubt come up with good suggestions. With a note of caution that new appropriability mechanisms might have unforeseen effects,[259] some possibilities are outlined here.

A mini-patent or registration system could be established to support appropriability of nonpatentable information in this category.[260] The current combination of secrecy, security measures, learning and espionage strategies, licensing arrangements, and litigation could continue virtually undisturbed, with a disclosure and registration mechanism replacing secrecy for the limited category of exposure data. Resources could be shifted from investment in security symbols to enforcement of those particular entitlements. The standards for registration might vary with the context and could perhaps be the subject of negotiation.[261] The system could require registrants to claim the value and life span of their work as a basis for some period of automatic exclusive use. Rivals could challenge the claims and the registrant might pay or negotiate for more favorable terms. Any violation of the new system's exclusivity provisions could be subject to common law remedial actions.[262]

Disputes over claims might be a new source of litigation, but it would not be fundamentally different in kind from current trade secret litigation. Such a system would increase the certainty of firms' expectations and raise the value of some information. This might encourage R&D investment based on the same reasoning that supports the patent system. It would reduce the costs of protecting the secrets subject to it, though much of the symbolic protection would still be required for other secrets, and espionage expenditures might be largely unaffected.[263]

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259. DREYFUSS, *supra* note 88, at 28-30 (pointing out some of the practical difficulties inherent in the process of fine-tuning intellectual property rules).

Fears of international competitive disadvantage are probably overdrawn, as the pattern is for industrial nations to harmonize their rules. If the United States were to adopt a special rule for secrecy about pollution, others would follow suit.

260. Mary L. Lyndon, *The Trade Secret Exemption in Environmental and Worker Hazard Communications Laws* 54-56 (1986) (unpublished manuscript, on file with author); *see* Rochelle C. Dreyfuss, *Information Products: A Challenge To Intellectual Property Theory*, 20 N.Y.U. J. INT'L L. & POL. 897 (1988) (proposing an international safety net registration system for information products). Registration systems have been used by several European countries to supplement their patent system and are used in a variety of ways by different United States intellectual property schemes.

The 1983 Orphan Drug Act, to foster development of drugs for rare diseases, gives exclusive use terms of seven years. An Orphan Products Board is established at 42 U.S.C. § 236. *See* Andrew Pollack, *Orphan Drug Law Spurs Debate*, N.Y. TIMES, Apr. 30, 1990, at D1 (while law has generally worked, it has been a bonanza for the makers of some very big drugs).

The Register of Copyrights allows computer programs to be partially withheld to protect trade secrets. 37 C.F.R. § 202.20(c)(vii) (1988) permits the deposit of only the identifying portions of the program.

261. This last approach would, of course, pose the problem of incumbents raising entry barriers. This problem exists anyway; disclosure would increase diffusion, which lowers entry barriers.

262. *See, e.g.*, C. Owen Paepke, *An Economic Interpretation of the Misappropriation Doctrine: Common Law Protection for Investments in Innovation*, 2 HIGH TECH. L.J. 55 (1987).

263. Documentation of techniques in use might be a new or increased cost.

The chief problems in designing a registration or patent system are articulating the fit and implementing enforcement.

The subject matter and duration of coverage will depend on the system's purpose. Current trade secret law is not specific about its goals; it is not clear from the law what specific function trade secrecy is meant to have in the innovation process. If trade secrets are conceived of as any valuable information that has not been patented, an alternative registration system with less stringent requirements than patent law may be preferable to trade secrecy from the inventor's point of view. If trade secrecy largely protects know-how information, it may not include much exposure information and may be largely unaffected by the new option.

In industries which already use patents heavily, a registration system may not require much adjustment. Product patents have been found to be most effective in drugs, pesticides, industrial organic chemicals, and in uncomplicated mechanical equipment. Process patents were also rated fairly highly by four chemical industries (drugs, plastic materials, inorganic chemicals, and organic chemicals).[264] These are the industries that are central to environmental and health concerns.

Enforcement considerations are also important. The literature, however, suggests that firms already are very involved in observing each other. Also, since the new system would only address pollution and health and safety studies, the existing regulatory system would provide a useful information context, including inventories, environmental audits, and the health sciences. Indeed the TSCA and NTI inventories might constitute an embryonic registration and enforcement system.[265]

There are other ways in which intellectual property law could support health and environmental regulation. A specifically environmental appropriability support would be consistent with current trends in intellectual property law which pay attention to the dynamics of individual industries.[266] Perhaps the most inventive synthesis is the Semiconductor Chip Act, which combines elements of patent, copyright, and trade secrecy law. Novelty is not required and even small advances are protected. The Act dispenses with the examination procedure used in patent law and adopts automatic protection, set at ten years. The registration system

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264. Levin et al., *supra* note 86, at 795-96.

265. Nicola Atkinson & Brad Sherman, *Intellectual Property and Environmental Protection*, 5 EUR. INTELL. PROP. R. 165 (1991) (addressing this possibility in the European system).

266. Cheung, *supra* note 53, at 52. Cheung suggests that any improvement in efficiency in the protection of ideas must be in the direction of delineating more clearly and at a lower cost just what rights are being transacted. "Given the defects of trade secrets, it seems that the more efficient course would be the refining of criteria for drafting and enforcing patent claims so that recourse to the trade-secret option may be reduced." *Id.*

See also Dreyfuss, *supra* note 88 (proposing a basic international system of protection for certain kinds of intellectual property—"information products"). Dreyfuss suggests that the traditional allocation of roles in intellectual property—broad regimes covering all new inventions, fine tuned by the judiciary to meet the needs of individual situations—may be shifting. The Chip Act may stand for the proposition that current intellectual property problems cannot be solved be accretion, but require greater attention by legislators. Dreyfuss, *supra* note 88, at 911 n.52; John A. Kiddwell, *Software and Semiconductors: Why Are We Confused?*, 70 MINN. L. REV. 533 (1985).

requires the deposit of a representation of each layer of the chip, but the applicant can withhold parts of the chip information as trade secrets. The Act also has specific provisions intended to address research and experiment problems analogous to those in the biotechnology context;[267] for example, reverse engineering for teaching, analyzing, and evaluating is not an infringement. This allows for subsequent compatible inventions.

A second type of specific adaptation is the Drug Price Competition Act of 1984.[268] The statute is an attempt to stimulate drug and medical device innovation and diffusion, in part through the release of more information to generic drug manufacturers. It extends patent terms of drugs which are the subject of the lengthy FDA premarketing registration processes, liberalizes public and competitive access to application information, including safety and efficacy data, and revises the registration process to encourage generic drug manufacture.

An environmental patent system might be a useful supplement to current regulation. EPA "technology forcing" strategies have been criticized as too uncertain and short term,[269] but the full range of possibilities for improving innovation in the environmental area has not been explored. A specialized registration system could be crafted to encourage innovation.[270] The basic aim would be to provide an additional incentive to develop new environmental controls.[271] Such a system need not be as generalizable as the common law and patent system are. Its administrative costs might be low if it were designed to provide for flexible management, or even for self-enforcement.[272] There are other options, including use of an extension service, modeled on the agricultural extension service. Rating systems, such as the Europeans are developing, also provide appropriability.[273]

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267. Dreyfuss, *supra* note 88, at 906-09. Biotechnology products must be deposited, to compensate for the fact that written specifications do not adequately reveal the ideas in the inventions. The deposit system is vulnerable to misuse, however; access to study the organism also provides the opportunity to acquire it by allowing it to reproduce. *See* Ellen J. Flannery & Peter B. Hutt, *Balancing Competition and Patent Protection in the Drug Industry: The Drug Price Competition and Patent Term Restoration Act of 1984*, 40 FOOD DRUG COSM. L.J. 269 (1985).

268. 21 U.S.C. § 355 (1988); 35 U.S.C. § 156 (1988); *see* Dreyfuss *supra* note 88, at 910; *see also* Susan Kopp Keyack, Note, *The Drug Price Competition and Patent Term Restoration Act of 1984: Is It a Healthy Long Term Solution?*, 21 RUTGERS L.J. 147 (1989).

269. Ashford et. al, *supra* note 189; Ashford & Heaton, Jr., *supra* note 189. Removing uncertainty in government policy would stimulate innovation. CHRISTOPHER FREEMAN, THE ECONOMICS OF INDUSTRIAL INNOVATION 167-68 (1982). *But see* BURTON H. KLEIN, DYNAMIC ECONOMICS (1977) (uncertainty is good).

270. This proposal has been made elsewhere. *See* Atkinson & Sherman, *supra* note 265, at 169 n.30.

271. MORTON KAMIEN & NANCY SCHWARTZ, MARKET STRUCTURE AND INNOVATION (1983). This may only work in large industries, with environmental problems which are structured to support an incentive.

272. Entry and other antitrust concerns could be integrated into the rule structure. For a discussion of ongoing activity in analysis of intersection of innovation and antitrust concerns, see Douglas Ginsburg, *Antitrust, Uncertainty and Technological Innovation*, 24 ANTITRUST BULL. 635 (1979). Thomas M. Jorde & David J. Teece, *Innovation, Cooperation, and Antitrust: Striking the Right Balance*, 4 HIGH TECH. L.J. 1 (1989) (suggesting greater use of commercial alliance arrangements to encourage innovation).

273. *See* Atkinson & Sherman, *supra* note 265.

Using patent law as an instrument to achieve goals which are usually categorized as "environmental" may seem to be a departure from intellectual property law's familiar task of encouraging the development of technology. Atkinson and Sherman have noted that one underlying ethic of intellectual property law is a laissez-faire neutrality as to types of invention to be encouraged. They suggest that this tendency has increased in strength in the latter part of the twentieth century, exacerbating the isolation of intellectual property law from other parts of the law, whereas the opposite has occurred in other areas, where theorists have pursued integration.[274] The true concern of intellectual property law is clearly not to produce technology without any qualitative constraints, and a mild constraint would be to require that it encourage efficient technology. Efficient innovation in this sense can be narrowly defined to include minimizing damaging externalities. More expansively, efficient technology would progress along flexible and sustainable channels of development.

V. CONCLUSION

The myth of Pandora's box, in Sisella Bok's words, "unfolds interweaving layers of secrecy and revelation. [It] is one of the many tales of calamities befalling those who uncover what is concealed and thereby release dangerous forces that should have been left in darkness and silence."[275] At the same time, Bok notes that it is Oedipus' revelation of the Sphinx's riddle which ends the reign of terror over Thebes.[276] These stories express the link between knowledge, power, and freedom. Because secrets appear both unstable and powerful, we start from a common ambivalence about confronting them.[277] Perhaps it is better to leave them alone. Yet we know from experience that if we carefully explore the boundaries of a secret, we may find that it is not as complex or impressive as it had seemed.

The protection that the common law gives to commercially valuable secrets cannot be extended to health and environmental information without ignoring the basic principles of trade secret law, such as notice and duty, and those of the related areas of warning, consent, and privacy. The only way to grant such protection is simply to declare trade secrets "property," but this is not supported by economic analysis or by any of the standard approaches to entitlements. Learning about pollution is a social project, and blocking its progress cannot credibly be made into a private privilege. Trade secrecy doctrines, therefore, should not be applied to health and environmental information.

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274. *Id.* at 170; *see also* discussion *supra* of development of information entitlements related to chemical industry.

275. BOK, *supra* note 2, at 4.

276. *Id.* at 5.

277. *Id.*