SECRECY AND ACCESS IN AN INNOVATION INTENSIVE ECONOMY: REORDERING INFORMATION PRIVILEGES IN ENVIRONMENTAL, HEALTH, AND SAFETY LAW

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This article examines the law concerned with access to information that is commercially valuable when it is kept secret but is also essential to environmental, health, and safety (EHS) risk evaluation. EHS law stimulates sustainable economic activity, including new technologies, and thus complements intellectual property law. Access to EHS information is essential to risk management, but current disclosure obligations are unclear, as the law is a patchwork of familiar but ill-fitting concepts and entitlements. The article discusses the current law that affects disclosure, taking into account recent changes in the technological and economic landscape. It also describes the contrasting uses of EHS information in risk management and in commercial competition. When the tensions between commercial uses of information and EHS risk management are viewed in context, the essential functions and the value of EHS disclosure become apparent. The article draws the outlines of a realignment of the relationship between the two interests in the information. It concludes that, rather that balance the two competing interests, the law should make clear that EHS disclosure is the general rule and should allow only very limited nondisclosure privileges to protect emerging innovations.

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INTRODUCTION

Law and scholarship are increasingly concerned with the creation and flow of information. This article examines the law concerned with access to information that is commercially valuable when it is kept secret, but is also essential to the management of environmental, health, and safety (EHS) risks. A conflict between these two competing interests may arise, for example, when a business wants to keep confidential the identity of chemicals in a pharmaceutical or plastics formula, but other interests want to know its ingredients in order to evaluate its EHS effects. The tension between these two concerns presents a number of issues and affects many interests.[1] This article suggests that it is time to reevaluate the law's uneasy accommodation between risk management and commercial uses of EHS information.

Commercial interests and EHS access needs clash in a variety of contexts, including disputes over confidentiality clauses in employment contracts, motions to seal discovery in litigation, and administrative agency disclosure decisions.[2] Lack of clarity in the law has led to a default mode of decision making, case-by-case balancing of interests. This approach tends to favor the party with the more immediate, concrete, and well-financed interest, which is most often the commercial party.

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1. There is a substantial literature on access and secrecy. *See, e.g.*, 26 CHARLES ALAN WRIGHT & KENNETH W. GRAHAM, JR., FEDERAL PRACTICE AND PROCEDURE, FEDERAL RULES OF EVIDENCE, §§ 5642–52 (West 1992). Treatments of the specific conflict between access to evaluate EHS effects and commercial interests in confidentiality include Mary L. Lyndon, *Secrecy and Innovation in Tort Law and Regulation*, 23 N.M. L. REV. 1 (1993); Thomas O. McGarity & Sidney A. Shapiro, *The Trade Secret Status of Health and Safety Testing Information: Reforming Agency Disclosure Policies*, 93 HARV. L. REV. 837 (1980); David Michaels & Neil Vidmar, eds., *Symposium on Sequestered Science: The Consequences of Undisclosed Knowledge*, 69 LAW & CONTEMP. PROBS. 1 (2006); Wendy E. Wagner, *Commons Ignorance: The Failure of Environmental Law to Produce Needed Information on Health and the Environment*, 53 DUKE L.J. 1619 (2004).

2. Chemical identity is just one of the many kinds of information that is important to EHS risk management. *See infra* Part III.A. In this discussion, I use "data" and "information" as synonyms. For a useful exploration of alternate meanings and terminology, see Michael K. Buckland, *Information as Thing*, 42 J. AM. SOC'Y INFO. SCI. 351 (1991). Also, I use the terms "commercial" and "competitive" to describe business incentives to control data. A broader term, such as "market incentives," would elide individual firms' interests with the larger market's need for EHS information. Economic actors in general lose out when individual firms' short term interests delay or undermine the quality of risk assessment.

Balancing may also be shortsighted, as decision makers may to fail to perceive the systemic implications of each particular dispute. This outcome is particularly problematic when the larger context is evolving rapidly, as information technologies and the biological sciences are doing now. As the value of information increases in the contemporary economy and firms seek greater control over it, expansive claims of privilege erode access to EHS information.

Intellectual property law, particularly patent and trade secret law, is sometimes invoked in support of claims of entitlement not to disclose EHS information.[3] However, these fields are concerned with supporting research and development (R&D) incentives and commercial ethical norms; they do not address EHS risks. Patent and trade secret laws assume the existence of other legal frameworks to guide the quality of technical development. In an important sense, EHS concerns precede those of intellectual property. Access to EHS information is essential to risk management, which in turn facilitates the development of better technologies.[4] Thus, to invoke intellectual property law to exempt firms from EHS monitoring would disable both agendas.

Getting access rules right is particularly important in EHS matters because this knowledge is needed for so many individual and institutional decisions, yet the knowledge base is formed from a complex mix of dispersed information. Society as a whole sustains substantial losses and systemic distortions when it does not marshal these information resources carefully.[5] Loose exemptions for commercial information allow

3. *E.g.*, Phillip Morris, Inc. v. Reilly, 312 F.3d 24 (1st Cir. 2002). *But see* United Steelworkers of Am. v. Auchter, 763 F.2d 728 (3rd Cir. 1985).

4. I use the generic term "risk assessment" to mean the thread of risk evaluation that runs through innumerable personal and institutional decisions. Although regulatory agencies have developed a complex methodology, Quantitative Risk Assessment (QRA), to organize some regulatory decisions, businesses and individuals also must assess EHS risks at home and at work. Here I am not specifically concerned with formal QRA, except to the extent that it is an important part of the more general risk assessment that the society normally conducts through the market and other social institutions. *See* John S. Applegate, *A Beginning and Not an End in Itself: The Role of Risk Assessment in Environmental Decision Making*, 63 U. CIN. L. REV. 1643 (1995) (describing quantitative risk assessment, its role in regulation and illustrating the important contributions of public participation in risk assessment); John S. Applegate, *The Perils of Unreasonable Risk, Information, Regulatory Policy, and Toxic Substances Control*, 91 COLUM. L. REV. 261 (1991).

5. When the quality of some products is invisible, the entire market segment

firms to opt out of societal learning and drain resources from the market, from research, and from regulation. Excessive private control over health and environmental information creates pockets of static information within a system that needs to be dynamic. As a result, the science that addresses health and environmental risks must work around holes in understanding. Secrecy imposes costs that become imbedded in the infrastructure, and opportunities to develop better technologies and economic patterns are lost.

This article outlines the current law affecting EHS access, taking into account recent changes in the technological and economic landscape. When the tension between commercial uses of information and EHS risk management is viewed in context, the essential functions of EHS disclosure become apparent. The article draws the outlines of a realignment of the relationship between commercial and EHS interests in risk-related information. It concludes that, rather than balancing the two interests, the law should return to first principles and make it clear that EHS disclosure is the general rule. Only very limited nondisclosure privileges should be allowed to protect new and emerging innovations.[6]

Part I places the EHS access issue in the context of larger developments that are affecting both intellectual property and EHS science and regulation. The discussion begins in Part I.A with a description of the competing interests in EHS information. Part I.B discusses the functions of intellectual property law and EHS risk management and describes points of contact or interaction between them. The two fields of law developed separately, but their functions now overlap, as both are concerned with guiding positive technological change. Part I.C notes some particular dilemmas posed by the recent explosion of science and information technologies. These developments both increase the pressure on private actors to control informa-

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suffers. George A. Akerlof, *The Market for "Lemons": Quality Uncertainty and the Market Mechanism*, 84 Q. J. ECON. 488 (1970). *See* Kim JoDene Donat, *Engineering Akerlof Lemons: Information Asymmetry, Externalities, and Market Intervention in the Genetically Modified Food Market*, 12 MINN. J. GLOBAL TRADE 417 (2003) (applying the "lemons" model to the world market for genetically modified food products); Mary L. Lyndon, *Information Economics and Chemical Toxicity: Designing Laws to Produce and Use Data*, 87 MICH. L. REV. 1795, 1814–17 (1989) (describing adverse effects of information asymmetries in the market for chemicals and related products).

6. *See infra* Part IV.

tion and also make it more difficult to do so.

The article then looks beneath the surface of current entitlement claims based upon intellectual property and trade secrecy to trace the current trajectory of the law. Part II discusses three kinds of law concerned with disclosure of information: intellectual property, trade secret, and federal freedom of information law. Arguments against disclosure of EHS information often rely on trade secret and patent law concepts. Parts II.A and II.B explain why patents and trade secrets are limited entitlements. Because information diffusion itself is a prime source of innovation, excessive secrecy creates inefficiencies in research. Part II.C suggests that pressures for greater entitlements to withhold information appear to be creating expansive nondisclosure privileges, particularly in the regulatory context, where courts and agencies increasingly defer to commercial interests. Here, privileges now extend well beyond their original rationales, rooted in intellectual property and trade secrecy. Where market actors claiming secrecy entitlement are themselves the source of EHS risks, commercial justifications for confidentiality are especially weak.

Access and disclosure laws allocate information to different interests and functions, either risk assessment or commercial advantage. Part III looks first at data dynamics in risk management, then at the commercial uses of the same data. Part III.A describes EHS risk information as dispersed and variegated; risk research requires wide open and long term access to risk data in order to succeed. Partial access to data shortchanges risk management and distorts and undermines it, with systemic, long-term costs. Part III.B suggests that commercial users have relatively focused interests in the same data. Both legitimate commercial incentives and efforts to avoid scrutiny are often relatively narrow and temporary. Understanding the general "shape" of the two applications of the information may provide a basis for crafting alternative ways of resolving the tensions between access and secrecy.

The article concludes that commercial claims to information privilege should bear a heavy burden in the risk management setting. Part IV recommends a course correction: a clear presumption of "no privilege" to conceal EHS information, with a bright-line time limit on confidentiality of any information that falls within narrow exceptions to the disclosure rule. If the law removed the broad option of secrecy, then private in-

centives might shift toward greater responsibility, yielding more research about EHS impacts and production of less costly technologies. Moreover, new models of collaborative research will facilitate EHS research. It is time to reshape the legal relationship between the EHS access and commercial secrecy.

I. THE ACCESS QUESTION IN CONTEXT

A. Conflicting Interests in EHS Information

Information is valuable, and access to it is often disputed.[7]

7. Sometimes the motivations for secrecy are mixed and ambiguous. Both public and private entities may seek to avoid transparency in a variety of settings that touch the public. *See* Kimball Brace, Doug Chapin & Wayne Arden, *Whose Data Is It Anyway?: Conflicts Between Freedom of Information and Trade Secret Protection in Legislative Redistricting*, 21 STETSON L. REV. 723 (1992); Michael A. Carrier, *Vote Counting, Technology and Unintended Consequences*, 79 ST. JOHN'S L. REV. 645 (2005); Cindy Alberts Carson, *Raiders of the Lost Scrolls: The Right of Scholarly Access to the Content of Historic Documents*, 16 MICH. J. INT'L. L. 299 (1995); Lillie Coney, *E-Voting: A Tale of Lost Votes*, 23 J. MARSHALL J. COMPUTER & INFO. L. 509 (2005); Barry Kellman, David S. Gualtieri & Edward S. Tanzman, *Disarmament and Disclosure: How Arms Control Verification Can Proceed Without Threatening Confidential Business Information*, 36 HARV. INT'L L. J. 71 (1995); Jennifer N. Mellon, *Manufacturing Convictions: Why Defendants Are Entitled to the Data Underlying Forensic DNA Kits*, 51 DUKE L. J. 1097 (2001); Donald F. Santa, Jr., *Who Needs What, and Why? Reporting and Disclosure Obligations in Emerging Competitive Electricity Markets*, 21 ENERGY L.J. 1 (2000) (discussing confidentiality issues raised in setting of restructured energy industry and regulation); Daniel P. Tokaji, *The Paperless Chase: Electronic Voting and Democratic Values*, 73 FORDHAM L. REV. 1711 (2005); William A. Wright, *Public Access to Vote-Counting Software*, 1995 U. CHI. LEGAL F. 547 (1995); Lawrence K. Altman, *Manufacturer of Artificial Heart Forbids Doctors to Talk About Patient's Condition*, N.Y. TIMES, July 13, 2001, at A18; Nancy Gibbs, *Blue Truth, Red Truth*, TIME, Sept. 27, 2004, at 24 (regarding documents relied on by Dan Rather in news report concerning President George W. Bush's military service not released); James Glanz & Eric Lipton, *Vast Detail on Towers' Collapse May Be Sealed*, N.Y. TIMES, Sept. 30, 2002, at A1 (confidentiality agreements prevent experts from disclosing findings on how and why the World Trade Center towers collapsed); Linda Greenhouse, *Administration Says a 'Zone of Autonomy' Justifies Its Secrecy on Energy Task Force*, N.Y. TIMES, Apr. 25, 2004, at A16; Laura M. Holson, *California Cites Generators for Withholding Documents*, N.Y. TIMES, June 29, 2001, at A18 (companies resisted compliance with regulatory subpoena absent satisfactory confidentiality protections); Lawrence Lessig, *Copyrighting the President*, WIRED, August 2003, at 94 (discussing whether copyright law supports NBC control over use of video tapes of presidential interviews); Christopher Marquis, *Democrats Complain About Missile Test Secrecy*, N.Y. TIMES, June 13, 2002, at A34; David E. Rosenbaum, *Judge Allows Unusual Bid to Get Data From Census*, N.Y. TIMES, Jan. 26, 2002, at A12 (raw census data relied upon for Congressional redistricting and disbursement of federal aid to cities and states must be revealed under 1928 law that provides that government must turn over information if it is requested

In the EHS setting, two legitimate interests compete for control over data. First, access to data enables assessment of health and environmental risks. Such assessments are inherent in a range of market, scientific, and individual decisions. The second legitimate interest is reliance on secrecy to maintain or enhance the commercial value of a product or process.

There is also a third interest in play: the desire to avoid scrutiny. Social, political, and market interests in monitoring EHS risks have expanded dramatically in the past few decades. Yet, since tort and regulatory disclosure requirements may reveal the social costs of economic activity, there are strong countervailing incentives to avoid this visibility. Predictable legal arguments follow from "camouflage" incentives, including expansive claims of legal right to control access to EHS data.

Camouflage may be achieved in a variety of ways. Firms may simply not tell all they know[8] or may disguise negative information[9]—sometimes violating regulatory reporting require-

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by seven members of Congress).

8. Alex Berenson, *Medical Journal Criticizes Merck Over Vioxx Data*, N.Y. TIMES, Dec. 9, 2005, at A1 (New England Journal of Medicine's executive editor states that company "did not disclose all they knew[, and] . . . [t]here were serious negative consequences for the public health as a result of that."); Keith Bradsher, *S.U.V. Tire Defects Were Known in '96 But Not Reported*, N.Y. TIMES, June 24, 2001, at A1; Barnaby Feder, *Too Tiny for Trouble? Scientists Take a Look*, N.Y. TIMES, Nov. 29, 2005, at F14; David Cay Johnston & Melanie Warner, *Tobacco Makers Lose Key Ruling on Latest Suits*, N.Y. TIMES, Sept. 26, 2006, at A1 (federal district court found substantial evidence that manufacturers knew that light cigarettes were at least as dangerous as regular cigarettes); Stephen Labaton & Lowell Bergman, *Documents Indicate Ford Knew of Engine Defect But Was Silent*, N.Y. TIMES, Sept. 12, 2000, at A1; Sarah Lyall, *British Wrongly Lulled People on 'Mad Cow,' Report Finds*, N.Y. TIMES, Oct. 27, 2000, at A8; *Mad Cow Watch Goes Blind*, USA TODAY, Aug. 4, 2006, at 10A (federal government refuses permission to test for mad cow, as large producers resist smaller farms' move to institute greater protections); Barry Meier, *Guidant Case May Involve Crime Inquiry*, N.Y. TIMES, Sept. 29, 2005, at C1 (manufacturer did not warn doctors for three years after it knew one defibrillator had potential electrical defect); Micheal Moss & Adrianne Appel, *Company's Silence Countered Safety Fears About Asbestos*, N.Y. TIMES, July 9, 2002, at A1 (after asbestos health effects were public, W.R. Grace reduced asbestos content in its fire-proofing spray, but touted it as "asbestos-free"); Robert N. Proctor, Op-Ed., *Puffing on Polonium*, N.Y. TIMES, Dec. 1, 2006, at A31 ("The industry has been aware at least since the 1960s that cigarettes contain significant levels of polonium."); Greg Winter, *F.D.A. Survey Finds Faulty Listings of Possible Food Allergens*, N.Y. TIMES, Apr. 3, 2001, at C1 (as many as 25% of manufacturers failed to list common ingredients that can cause potentially fatal allergic reactions); Environmental Working Group, *Hundreds of Personal Care Products Contain Poorly Studied Nano-materials*, EWG, Oct. 10, 2006, http://ewg.org/issues/cosmetics/20061010/index.php.

9. The precise import of EHS data may take time and research to discover.

ments.[10] Apparently valid proprietary claims also may obscure risks,[11] since nondisclosure privileges may seem to give firms the option of claiming EHS data as their own. Firms may enforce broad confidentiality clauses in their employment contracts;[12] they may secure confidentiality protective orders in court,[13] settle litigation with agreements that provide for silence,[14] or secure favorable legislation limiting their expo-

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The ambiguity may become an opportunity for camouflage. *See, e.g.*, Lissy C. Friedman, Richard A. Daynard & Christopher N. Banthin, *How Tobacco-Friendly Science Escapes Scrutiny in the Courtroom*, 95 AM. J. PUB. HEALTH 1, 16–20 (2005); Melissa Lee Phillips, *Journal Retracts Chromium Study*, THE SCIENTIST, June 7, 2006, http://www.the-scientist.com/news/display/23590/; *Chromium Industry Withheld Evidence of Workplace Cancer Risk*, ENS, Feb. 24, 2006, http://nickelchromium.martinandjones.com/news/nickel-chromium.pdf; Melissa Lee Phillips, *Toxicologist Should be Censured, Says Group*, THE SCIENTIST, http://www.the-scientist.com/news/display/24224/; David Michaels, *DOUBT Is Their Product*, 292 SCI. AM. 6 (2005); John Stauber & Sheldon Rampton, *Wolves in Sheep's Clothing "Special-Interest Watchdogs" Exposed as Tobacco Industry Front Group*, 3 PR WATCH 3, *available at* http://www.prwatch.org/prwissues/1996Q3/wolves.html; John H. Cushman, Jr., *After 'Silent Spring,' Industry Put Spin on All It Brewed*, N.Y. TIMES, Mar. 26, 2001, at A14; Jennifer Lee, *Popular Pesticide Faulted for Frogs' Sexual Abnormalities*, N.Y. TIMES, June 19, 2003, at A20 (pesticide atrazine affects development of frogs and may cause sexual abnormalities); Andrew Schneider, *Pressure at OSHA to Alter Warning—Author of Advisory on Asbestos in Brakes Faces Suspension for Refusing to Revise It*, BALTIMORE SUN, Nov. 20, 2006, at 1A; Rick Weiss, *Chromium Evidence Buried, Report Says*, WASH. POST, Feb. 24, 2006, at A3.

10. Marianne Lavelle, *E.P.A.'s Amnesty Has Become a Mixed Blessing: Be Careful What You Wish For*, NAT'L L.J., Mar. 3, 1997, at A1 (under an amnesty program in place from 1991–1996, manufacturers handed in eleven thousand old, unpublished studies and adverse reaction reports). *See also* Erik Stokstad, *Biopharming Rules Broken*, 313 SCIENCE 901 (2006) (U.S. district court in Hawaii finds U.S. Department of Agriculture broke environmental laws by allowing four companies to grow HIV vaccines and other pharmaceuticals in genetically modified crops on four Hawaiian islands); Michael Hawthorne, *EPA Charges DuPont Hid Teflon's Risks*, CHICAGO TRIB., Jan. 18, 2005, at C8; Environmental Working Group, *Chronology of the Teflon Case*, EWG, http://www.ewg.org/issues/siteindex/issues.php?issueid=5014; *Secret U.S. Biopharms Growing Experimental Drugs*, ENS, July 16, 2002, http://www.mapcruzin.com/news/bte 071602a.htm.

11. *See infra* Parts II.C.2, III.B.4. Professor Wendy Wagner, in *Commons Ignorance*, *supra* note 1, describes additional instances of camouflage to those listed *supra* notes 8–10 and analyzes the legal and market dynamics that foster them.

12. Andrew Blum, *Reynolds Sues to Gag Ex-Staffers*, NAT'L L.J. Mar. 1, 1993, at A3; *see generally* Government Accountability Project, http://www.whistleblower.org.

13. Dan Ferber, *Beset by Lawsuits, IBM Blocks a Study That Used Its Data*, 304 SCIENCE 937 (plaintiffs' epidemiological analysis of data revealed in the lawsuit was subject to court protective order and blocked from publication in medical journal).

14. Daniel J. Givelber & Anthony Robbins, *Public Health Versus Court-Sponsored Secrecy*, 69 LAW & CONTEMP. PROBS. 131 (2006). *See also Symposium:*

sure.[15] In each of these settings firms invoke trade secrecy as a doctrinal basis for withholding information.[16] They may also invoke policy concerns from intellectual property, as when a firm argues that systemic incentives to invest in new technologies will unravel if commercial secrets are revealed. Law makers and courts have sometimes been convinced of this danger and have concluded that EHS risk assessment's needs for data are "trumped" by commercial interests.[17] However, this conclusion is at least overbroad, if not entirely mistaken. To see why this is so, it is helpful to identify more specifically the functional relationship between intellectual property and EHS law.

B. Intellectual Property Law and Risk Management

Intellectual property law and risk management law are consistent with each other. Indeed, they are symbiotic in an important sense.

Intellectual property law is concerned with supporting con-

Secrecy in Litigation, 81 CHI. KENT L. REV. 301, 301–808 (2006).

15. *Popular Smokeless Tobacco Brands Contain Greatest Nicotine Content*, NEWS RX, March 6, 2004, http://www.newsrx.com/article.php?articleID=169715 (under the Comprehensive Smokeless Tobacco Health Education Act of 1986, 15 U.S.C. §§ 4401 et seq., tobacco manufacturers report annually to the Centers for Disease Control (CDC) on the total nicotine, unprotonated nicotine, pH, and moisture content of smokeless tobacco products, information that is considered 'trade secret' or confidential under 5 U.S.C. § 552(b)(4) and 18 U.S.C. § 1905, and cannot be released to the public, but for which the CDC arranged for an analysis).

16. *Chemical Reaction*, THE ECONOMIST, Mar. 29 2001, at 62 (commenting on Bill Moyers' PBS show "Trade Secrets," The Economist observes that for the chemical industry to earn the public trust might require "admitting that some of the chemicals deemed so essential to modern life might—just possibly—be slowly poisoning us"); Roger Dobson & Jeanne Lenzer, *US Regulator Suppresses Vital Data on Prescription Drugs on Sale in Britain*, THE INDEPENDENT (UK), June 12, 2005 (ibuprofen related documents were considered proprietary and release would be a criminal offense, explained FDA official); Trade Secrets: Coming Clean—Just the Beginning, http://www.mapcruzin.com/news/news012601a.htm (regarding project of several groups, sparked by Moyers' report on Trade Secrets). Ibuprofen remained on the market, in spite of evidence that it causes heart attacks, while the FDA and the company were evaluating this risk. David J. Epstein, *Secret Ingredients: "Inert" Compounds May Be Chemically Active—And Toxic*, SCI. AM., Aug. 2003, at 22; Barry Meier, *F.D.A. Had Report of Short Circuit in Heart Devices*, N.Y. TIMES, Sept. 12, 2005, at A1 (FDA did not release alert information for months after it received it from manufacturer Guidant; it was unclear whether the FDA considered it confidential or had not reviewed it to determine confidentiality). *See infra* Part III.

17. Phillip Morris, Inc. v. Reilly, 312 F.3d 24 (1st Cir. 2002); *see infra* Part II.B.

tinuous, productive technical change. This includes "follow on" innovation, that is, refinements of existing technologies. Patents provide for patentees' legal control over the use of new technical information in return for its publication. Publication makes the information available for further R&D by others who may either seek a license from the patent holder to use the invention or may build upon the published information to produce new inventions. Patents thus mediate between old and new information and between "original" innovations and refinements.[18]

EHS law is concerned with creating conditions that stimulate sustainable economic activity, including technologies with minimal adverse EHS impacts. This is a relatively new field of law, and it is still coping with some start-up costs, including significant information deficits. EHS risks and harms stem in part from earlier technological choices by market actors, who did not account for externalized EHS costs and left the task of understanding the harmful effects to others. At least, that is the formal model. In reality, firms often know a great deal about the effects they cause, but they usually have not been required to share this information. Instead, the public sector has invested substantially in research to fill in the gaps in understanding. The creation and management of this research agenda has been guided in large part by tort law[19] and regulation.[20] In turn, this effort has stimulated the development of

18. *See, e.g.*, Edmund W. Kitch, *Elementary and Persistent Errors in the Economic Analysis of Intellectual Property*, 53 VAND. L. REV. 1727 (2000) (explaining consensus in literature on basic functions of intellectual property system); Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265 (1977) (prospecting theory of patents places coordinating role early in innovation process); Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839 (1990) (competition among patentees downstream in innovation is generally likely to yield a better result than broad singular control by early patentee).

19. Susan Haack, *Scientific Secrecy and "Spin": The Sad, Sleazy Saga of the Trials of Remune*, 69 LAW & CONTEMP. PROBS. 47 (2006).

20. *See* Daniel A. Farber, *Environmental Protection as a Learning Experience*, 27 LOY. L.A. L. REV. 791 (1994); Mary L. Lyndon, *Tort Law and Technology*, 12 YALE J. ON REG. 137 (1995); Wendy E. Wagner, *Choosing Ignorance in the Manufacture of Toxic Products*, 82 CORNELL L. REV. 773 (1997). Public EHS research efforts have struggled with many obstacles. Some of this has been due to the nature of this learning process. Some stems from the legal processes which privilege ignorance and give only limited authority to agencies to require testing. *See also* Holly E. Pettit, *Shifting the Experiments to the Lab: Does EPA Have a Mandatory Duty to Require Testing for Endocrine Disruption Effects Under the Toxic Substances Control Act?*, 30 ENVTL. L. 413 (2000); Wagner, *supra* note 1. Some has

new technologies and refinements in existing technologies, particularly in EHS performance. Performance requirements provide a frame for R&D efforts and they stimulate markets for innovation.[21] Regulation has required better performance by many industries, in part through regulatory reporting and disclosure.[22]

Intellectual property encourages investment in whatever improvements will sell. EHS law supplements intellectual property by limiting investment incentives to products and processes that will not be too costly to society. EHS law aims to enhance the sustainability of the market and society's infrastructure. Successful and sustainable technology depends upon robust risk evaluation and feedback, which is impossible without disclosure of relevant data. Both legitimate commercial interests and camouflage attempts may impede EHS risk management functions by restricting information access.

C. The Changing Information Landscape

Technical innovation has accelerated in the past few decades, altering the world to which familiar legal concepts apply. Both intellectual property and EHS risk management have

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been lack of financial support and also resistance from regulated industries. Professor David Case surveys the EPA's efforts to work with industries to encourage greater private research. *See* David W. Case, *The EPA's HPV Challenge Program: A Tort Liability Trap?*, 62 WASH. & LEE L. REV. 147 (2005). *See also infra* Part IV.B (regarding the HPV program and recent European initiatives).

21. However, the current state of EHS knowledge is incomplete, to say the least. *See* Chemical Regulation: Options Exist to Improve EPA's Ability to Assess Health Risks and Manage Its Chemical Review Program, GAO 05-458 (June 13, 2005). *See also* John S. Applegate & Katherine Baer, *Strategies for Closing the Chemical Data Gap*, CENTER FOR PROGRESSIVE REFORM (2006), *available at* http://www.progressiveregulation.org/articles/Closing_Data_Gaps_602.pdf; Robert H. Cutting & Lawrence B. Cahoon, *Thinking Outside the Box: Property Rights as a Key to Environmental Protection*, 22 PACE ENVTL. L. REV. 55, 60–67 (2005) (describing the data deficit); Lyndon, *supra* note 5; Wagner, *supra* note 20. *But see* James W. Conrad, *Open Secrets: The Widespread Availability of Informaiton About the Health and Environmental Effects of Chemicals*, 69 LAW & CONTEMP. PROB. 141 (2006) (surveying regulatory chemical information dissemination).

22. For perspective on current role of information in environmental regulation, see David W. Case, *Corporate Environmental Reporting as Informational Regulation: A Law and Economics Perspective*, 76 U. COLO. L. REV. 379 (2005); Bradley C. Karkkainen, *Default Rules in Private and Public Law: Extending Default Rules Beyond Purely Economic Relationships: Information-Forcing Enviromental Regulation*, 33 FLA. ST. U. L. REV. 861 (2006); Bradley C. Karkkainen, *Information as Environmental Regulation: TRI and Performance Benchmarking, Precursor to a New Paradigm?*, 89 GEO. L.J. 257 (2001).

been changed by expanded information technologies and rapid developments in science, particularly in the biomedical sciences.[23]

Professor J.H. Reichman has pointed out that the revolution in information technologies makes important innovations much more visible and therefore more quickly available for copying and refinement. This may dampen innovation incentives, as it tends to shorten the time span of a firm's control over its research results. In the older, slower world, a company could expect that it would take time for rivals to learn what it was doing and more time for them to generate a competitive response. Today, widespread access to information also yields greater opportunities to improve technologies. In this faster world of technical change, proprietary claims have greater value and importance as incentives, yet they may also impose greater social costs. Opportunities for follow-on innovations are also greater and are delayed by expanded proprietary claims. The field of intellectual property is responding to these changes by rethinking traditional notions of patent and copyright law.[24]

As Professor Reichman explains, the challenge is to understand how these legal mechanisms should function. Reichman suggests that their central role in intellectual property is to mediate between original inventors, second comers, and society in order to ensure that the costs of new developments are shared. This mediation in turn modulates investment incentives and profit so that they are distributed fairly evenly in the

23. Innovation economics and intellectual property law have been dynamic and expansive in the past few decades, tracking dramatic developments in science and technology. *See* David W. Case, *The Law and Economics of Environmental Information as Information*, 31 ENVTL. L. REP. 10773 (2001); Daniel C. Esty, *Environmental Protection in the Information Age*, 79 NYU L. REV. 115 (2004); William F. Pedersen, *Regulation and Information Disclosure: Parallel Universes and Beyond*, 25 HARV. ENVTL. L. REV. 151 (2001).

24. J.H. Reichman, *Taking Stock: The Law and Economics of Intellectual Property Rights: Of Green Tulips and Legal Kudzu: Repackaging Rights in Subpantenable Innovation*, 53 VAND. L. REV. 1743, 1764–72, (2000); J.H. Reichman, *Legal Hybrids Between the Patent and Copyright Paradigms*, 94 COLUM. L. REV. 2432, 2438–46, 2520–25 (1994) (changing technologies have transformed the temporal dynamics of innovation, reducing lead time that was essential to the basic patent-copyright intellectual property scheme; new forms of "hybrid" legal protections, including "portable trade secret entitlements" are proposed). For the response of Professor Mackay to Professor Reichman's reforms, see Ejan Mackay, *Legal Hybrids: Beyond Property and Monopoly?*, 94 COLUM. L. REV. 2630, 2634–39 (1994).

community concerned with the innovation stream in question.[25]

Legislators and scholars are polarized around the question of whether to expand or shrink legal entitlements to control the use of research results and creative products. Reichman points out that lawmakers have reacted to the new innovation dynamics by strengthening old forms of entitlements and establishing new ones that protect existing interests in the economy without regard to the mediating functions of intellectual property.[26] Indeed, as Part II discusses, the idea that patents and trade secrets are best understood as "property" has recently been asserted with greater rhetorical emphasis, even as leading scholars rediscover the weaknesses of this formulation for valuable information.[27] Expanded private entitlements have even challenged the notion of a public domain in information.[28] Professor Reichman has remarked that the classic configuration of patent and copyright law as islands of protection in a sea of competition has been reversed; we are left with a sea of legal protection and remote islands of free competition.[29]

Environmental, health, and safety law has also responded to technical changes. Information technologies enable enhanced perception and evaluation of EHS risks.[30] This new visibility also challenges firms' expectations concerning control over information. For instance, firms can no longer externalize pollution and wait for the effects to be noticed. Effects that were naturally "secret" a few decades ago are now more readily

25. Reichman, *Legal Hybrids*, *supra* note 24, at 2525–26.

26. *Id.*

27. *See infra* Parts II.A–B.

28. The role of the "public domain" is debated. *See* James Boyle, *The Second Enclosure Movement and the Construction of the Public Domain*, 66 LAW & CONTEMP. PROBS. 33 (2003); Robert P. Merges, *A New Dynamism in the Public Domain*, 71 U. CHI. L. REV. 183 (2004); Pamela Samuelson, *Enriching the Discourse on Public Domains*, 55 DUKE L. J. 783 (2006) (describing the multiple definitions of the public domain that are found in the literature and considering the potential benefits for the law of accepting the existence of multiple public domains).

29. J.H. Reichman, *Charting the Collapse of the Patent-Copyright Dichotomy: Premises for a Restructured International Intellectual Property System*, 13 CARDOZO ARTS & ENT. L.J. 475, 517 (1995). *See also* Rochelle Dreyfuss, *Protecting the Public Domain of Science: Has the Time for an Experimental Use Defense Arrived?*, 46 ARIZ. L. REV. 457, 465, 472 (2004).

30. *See* Brett M. Frischmann, *Infrastructure Commons*, 2005 MICH. ST. L. REV. 121 (2005) (applying infrastructure theory to environment and to information); *Scorecard—The Pollution Information Site*, http://www.scorecard.org (providing general information on pollution and an ability to identify major sources and types of air pollution by zip code).

apparent. Invisibility may be achieved only by ignorance and uncertainty about the precise meaning of the information we have.

Our new capacity to detect the presence of EHS hazards alters the relationship between commercial interests and EHS data. The need for risk management creates markets in scientific research, such as toxicology, epidemiology, and ecological sciences. In this setting a good deal of information about health, ecosystems, and materials has potential commercial value, either as a product or related asset or as a critique of a product. Even very early or uncertain information, considered in this light, may be valuable or, potentially, a liability. The scientific community has become a central institution in the market and participates actively in risk management. Scientists today are engaged in debates over access and control of EHS information and are developing principles and practices to address many of the same issues that appear in legal disputes over EHS data.[31]

These developments have transformed EHS law and risk management and have also increased the importance of EHS risk data. In addition, they have altered the functional relationship between regulation and the market. Whereas EHS problems used to be seen as incidental defects in an otherwise well-functioning market, they are increasingly understood as systemic problems that pose an encompassing critique of the market and its projects. In this frame it is not plausible to "balance" secrecy and disclosure or treat it as an indulgence owed to market actors. Now nondisclosure may function as a pass to opt out of the larger learning system, which is fundamental to many social goals, including investment in sustainable technologies.

One aspect of these changes has been a gradual shift in the role of regulatory law. In the conventional model, a basic function of tort law and regulation is to look over and tweak the market's products and byproducts.[32] The market has deter-

31. *See* Sheila Jasanoff, *Transparency in Public Science: Purposes, Reasons, Limits*, 69 LAW &. CONTEMP. PROBS. 21 (2006). *See also infra* Parts III.A, IV.

32. Justice Breyer expressed this perspective in his concurring opinion in *General Electric Co. v. Joiner*, 522 U.S. 136, 148–49 (1997), when he remarked:

> [M]odern life, including good health as well as economic well-being, depends upon the use of artificial or manufactured substances, such as chemicals . . . . [It is therefore] important to see that judges fulfill their *Daubert* gate-keeping function, so that they help assure that the power-

mined the parameters of production and the law has tried to correct or deter bad private choices. This framework assumes that the information necessary to regulation has been or can be produced. *Ex post* screening of the market also allows negative effects to accumulate as long as they remain wholly or partially invisible. Invisibility provides firms with a regulatory benefit: the less coherent the evidence of the costs of their activities, the longer they can postpone accountability. Persistent ignorance about EHS risks has complicated the project of building a regulatory framework and has distorted public EHS research and private R&D. However, the old model is changing.

Today, regulatory agencies increasingly manage scientific research agendas and they effectively function as gatekeepers of new technologies. Professor Rebecca Eisenberg has pointed to the FDA's active role in regulating innovation and entry in the pharmaceutical industry.[33] She sees pharmaceuticals as "information-rich chemicals" that are in some ways more like information products than they are like other chemicals, such as industrial solvents. "Drugs are chemicals that have been tested extensively to determine their safety and efficacy in treating disease. It is the information derived from such testing that distinguishes the chemicals we call 'drugs' from similar chemicals sold for other purposes, or even for the same purposes."[34]

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ful engine of tort liability, which can generate strong financial incentives to reduce, or to eliminate, production, points toward the right substances and does not destroy the wrong ones.

Id. Thus, regulation is added onto the market in the conventional model. For a description of statutes and policy, see ROBERT V. PERCIVAL ET AL., ENVIRONMENTAL REGULATION—LAW, SCIENCE AND POLICY (5th ed. 2006); Albert C. Lin, *The Unifying Role of Harm in Environmental Law*, 2006 WIS. L. REV. 897, 898–99 (2006).

33. Rebecca S. Eisenberg, *The Problem of New Uses*, 5 YALE J. HEALTH POL'Y, L. & ETHICS 717, 730 (2005).

34. *Id.* at 731. FDA product review is concerned with safety and effectiveness for the intended use, which manufacturers choose; they do not test for side effects that their products cause after marketing of the original drug or for effects from other uses. *See id.* Voluntary disclosure of clinical testing information has become a major issue in pharmaceuticals regulation and policy. In January 2005, four major pharmaceutical companies announced that they would establish a registry of all clinical trials, going beyond earlier voluntary efforts in the industry. However, the success of the registry is not assured. *See, e.g.*, Benjamin Falit, *Pharma's Commitment to Maintaining a Clinical Trial Register: Increased Transparency or Contrived Public Appeasement?*, 33 J. L. MED. & ETHICS 391 (2005); Mitchell Oates, *Facilitating Informed Medical Treatment Through Production and Disclosure of Research into Off-Label Uses of Pharmaceuticals*, 80 N.Y.U. L. REV.

If we characterize products in terms of the information we have about them, drugs are relatively well researched. However, apart from the relatively narrow category of pharmaceuticals, most chemicals are information deficient.[35] The law currently fails to require research on the causes of environmental and occupational health risks until after they are deployed. It leaves the burden of discovering and proving harms to those outside the industry. The public and those exposed to risk must, in effect, "reverse engineer" the harmful effects of the market's activities. Regulation becomes a matter of "coping with uncertainty."[36] A patchwork of reporting and minimal study requirements has provided regulated businesses with a public relations buffer against full participation in research. However, it has not solved the problem of dysfunctional information incentives.

Commercial interests in controlling information seem to be

1272 (2005) (discussing law and economics of post-registration testing); Pamela Politis, *Transition from the Carrot to the Stick: The Evolution of Pharmaceutical Regulations Concerning Pediatric Drug Testing*, 12 WIDENER L. REV. 271 (2005) (examining effects of recent statutes designed to foster pediatric testing).

35. Regulatory action is triggered by an adverse or risky effect that must exist and be identified and evaluated before it can be controlled. For a thorough survey of the relevant statutes, cases, and issues, see PERCIVAL ET AL., *supra* note 32; Wagner, *supra* note 1, at 1663–77.

36. Classic cases addressing the dilemma of risk regulation are *Industrial Union Dept., AFL-CIO v. American Petroleum Institute*, 448 U.S. 607 (1980) (holding that OSHA must identify a significant risk before issuing standards), and *Ethyl Corp. v. EPA*, 541 F.2d 1 (D.C. Cir. 1976) (*en banc*) (holding that the EPA may draw its conclusions from suspected but not completely substantiated facts). Contrasting views on the theory of regulatory risk regulation are seen in STEPHEN BREYER, BREAKING THE VICIOUS CIRCLE— TOWARD EFFECTIVE RISK REGULATION (1993), and SIDNEY A. SHAPIRO & ROBERT L. GLICKSMAN, RISK REGULATION AT RISK—RESTORING A PRAGMATIC APPROACH (2003). *See also* Adam M. Finkel, *A Second Opinion on an Environmental Misdiagnosis: The Risky Prescriptions of Breaking the Vicious Circle*, 3 N.Y.U. ENVTL. L. J. 295 (1995) (commenting on Justice Breyer's proposal); Howard Latin, *The Feasibility of Occupational Health Standards: An Essay on Legal Decision Making Under Uncertainty*, 78 NW. U. L. REV. 583 (1983) (providing an early analysis of risk assessment issues in the occupational health context).

One effect of science-based risk regulation has been a series of "science wars" battled out before agencies and in courts. *See* Howard Latin, *Good Science, Bad Regulation, and Toxic Risk Assesssment*, 5 YALE J. ON REG. 89 (1988); Thomas O. McGarity, *Our Science is Good Science and Their Science is Junk Science: Science-Based Strategies for Avoiding Accountability and Responsibility for Risk-Producing Products and Activities*, 52 U. KAN. L. REV. 897 (2004); Sidney A. Shapiro, *The Information Quality Act and Environmental Protection: The Perils of Reform by Appropriations Rider*, 28 WM. & MARY ENVTL. L. & POL'Y REV. 339 (2004); Wagner, *supra* note 1.

growing at the same time that EHS access is both more necessary and more productive. It is not surprising, then, that the legal relationship between the two uses of EHS data is unclear. The rules concerned with commercial confidentiality and EHS disclosure were once situated in different regions of the law. Their "convergence" in the pressure cooker of information competition and risk management scrutiny means that the law is continually contested and uncertain, leaving heightened camouflage incentives and an out-of-focus EHS framework for new technologies.

These factors partly explain the continual stream of reports on secret archives and missing data.[37] Such reports are likely to contribute to public distrust of firms' assurances on health and safety risks. In these episodes, secrecy may be publicly characterized as a "mistake": either the result of inattention or as a disagreement among scientists. However, behavior that hides negative information is predictable. The opportunity to mislead is built into the situation where firms know much more about their business and its effects than do outsiders.[38] From a firm's perspective, it will appear rational to delay disclosure, even while social costs and harms mount.[39]

As regulation has become more common, camouflage incentives have become a persistent dimension of the market and

37. *See* GERALD MARKOWITZ & DAVID ROSNER, DECEIT AND DENIAL: THE DEADLY POLITICS OF INDUSTRIAL POLLUTION (2002). For examples, see David S. Egilman & Susanna Rankin Bohme, *Over a Barrel: Corporate Corruption of Science and Its Effects on Workers and the Environment*, 11 INT'L J. OCC. & ENVTL. HEALTH 331, 331–37 (2005); David Michaels & Wendy Wagner, *Disclosure in Regulatory Science*, 302 SCIENCE 2073 (2003); Nancy Beiles, *What Monsanto Knew: Outraged by PCB Contamination, An Alabama Town Unearths a Company's Past*, THE NATION, May 29, 2000, at 18; Jamie Lincoln Kitman, *The Secret History of Lead*, THE NATION, Mar. 20, 2000, at 11; Jon Weiner, *Cancer, Chemicals and History: Companies Are Using New Tactics to Insure Past Misdeeds Aren't Revealed in Court*, THE NATION, Feb. 7, 2005, at 19.

Some revelations are disturbing. *See* Alan Cowell, *British Secretly Used Babies' Bones in Tests*, N.Y. TIMES, Oct. 1, 2001, at A6; Matthew L. Wald, *U.S. Alerted Photo Film Makers, Not Public, About Bomb Fallout*, N.Y. TIMES, Sept. 30, 1997, at A18; Matthew L. Wald, *Work on Weapons Affected Health, Government Admits*, N.Y. TIMES, July 15, 1999, at A12.

38. The tobacco industry offers a worst case example. The declaration of former Phillip Morris research scientist, Dr. Ian L. Uydess, is revealing. Commenting on the extent and depth of the company's knowledge about the chemistry and biology of tobacco, Dr. Uydess remarked, "I always considered this lack of public knowledge about the true capabilities of Philip Morris to be one of that company's greatest corporate advantages." Declaration of Former Philip Morris Employee Ian L. Uydess, 1996 WL 259476 (Apr. 1, 1996).

39. *See* David Michaels, *Doubt Is Their Product*, SCI. AM., June 2005, at 96.

regulation.[40] Confusion over whether commercial entitlements trump EHS access is virtually guaranteed by the current influence of pressures on EHS data allocation and a case-by-case balancing approach to the issue.

II. LAW AND DISCLOSURE

This section describes the role of information dissemination in patent law, and then discusses the common law of trade secrecy and statutory provisions concerning disclosure of EHS information by administrative agencies.

First, however, it is useful to remember that the rules governing the two different interests in EHS data evolved independently in separate legal traditions. Moreover, these laws operate within an encompassing web of legal doctrines that are also concerned with information access and exchange. Three signature concerns animate this "information law." One concern is privacy—necessary for individual autonomy.[41] Another issue is support for research and innovation, which involves balancing control with access to information.[42] A third essential concern is information's role as social currency in contemporary market and civic life.[43] Many legal rules and principles support accurate social interchange and speech.

For instance, fraud and warranty laws articulate basic obligations not to misrepresent facts to others where inaccuracies subvert choices and lead to loss.[44] "Camouflage" incentives encourage secretive behavior that may be fraudulent, depending on the circumstances. Another essential dimension is procedure, the law concerned with the fair management of adjudica-

40. *See* Wagner, *supra* note 1. For a parallel analysis of problems in the pharmaceuticals context, see Eisenberg, *supra* note 33.

41. *See* Julie E. Cohen, *Examined Lives: Information Privacy and the Subject as the Object*, 52 STAN. L. REV. 1873 (2000).

42. *See* discussion *infra* Part II.A.

43. *See* ALVIN I. GOLDMAN, KNOWLEDGE IN A SOCIAL WORLD (1999).

44. RESTATEMENT (SECOND) OF TORTS § 525 (1977) ("One who fraudulently makes a misrepresentation of fact, opinion, intention or law for the purpose of inducing another to act or to refrain from action in reliance upon it, is subject to liability to the other in deceit for pecuniary loss caused to him by his justifiable reliance upon the misrepresentation."); RESTATEMENT (THIRD) OF TORTS: PRODUCT LIABILITY § 9 (1998) ("One engaged in the business of selling or otherwise distributing products who, in connection with the sale of a product, makes a fraudulent, negligent, or innocent misrepresentation of material fact concerning the product is subject to liability for harm to persons or property caused by the misrepresentation.").

tion. The procedural reforms of the twentieth century generally enhanced the flow of useful information in legal processes.[45] The accuracy of evidence is crucial; disclosure in the service of accuracy is a foundational legal concern.

Access to risk information finds support in tort and criminal law, which traditionally have been concerned with deterring injuries. For example, intentional or careless actions that cause or threaten harm are prohibited or are actionable in the liability system. Tort and criminal law have been extended by EHS regulation as new types of products, injuries, and risks have emerged. Under negligence law, each person has a duty to take reasonable steps to protect and, more importantly, warn those who are exposed to the risks that he creates.[46] Legal duties to transfer risk data appear throughout the law, and these duties are to be waived only by the risk bearers, not the risk creator.[47] Access to EHS data is justified in these laws as fair and moral and also as efficient. Indeed, economists and law makers have supported disclosure as a non-intrusive way to correct market failures that cause health and environmental risks and harms.[48] Access facilitates an array of essential social and market responses that depend upon information production and sharing.

Commercial control over technical information has been supported through patent law and trade secrecy.[49] The two re-

45. Jeff A. Anderson et al., *The Work Product Doctrine*, 68 CORNELL L. REV. 760, 766 (1983); Jeffrey W. Stempel, *New Paradigm, Normal Science, or Crumbling Construct? Trends in Adjudicatory Procedure and Litigation Reform*, 59 BROOK. L. REV. 659, 715 (1993).

46. *See* RESTATEMENT (THIRD) OF TORTS: PROD. LIAB. §§ 2(c), 10, 13 & 18 (1998); RESTATEMENT (SECOND) OF TORTS §§ 297(b), 388–405 (1965); RESTATEMENT (THIRD) OF TORTS: LIABILITY FOR PHYSICAL HARM § 18 (Proposed Final Draft No. 1, 2005); RESTATEMENT (THIRD) OF TORTS: GENERAL PRINCIPLES § 16 (Discussion Draft 1999). *See also* Clifford Rechtschaffen, *The Warning Game: Evaluating Warnings Under California's Proposition 65*, 23 ECOLOGY L.Q. 303 (1996) (describing and evaluating California's elaboration of common law warning requirements).

47. Guido Calabresi, *Torts—The Law of the Mixed Society*, 56 TEX. L. REV. 519, 525 (1978). Legal protection of secret exposure would lead to a form of "total risk bearing" in Judge Calabresi's words. *Id.*

48. *See* Akerlof, *supra* note 5.

49. In addition to patent law and secrecy, which are the focus of this discussion, copyright is increasingly important, particularly in some science-related fields. For instance, the revolution in data management and communication has led to arguments for and against recognition of property rights in compilations of data. *See* Dov Greenbaum, *Are We Legislating Away Our Scientific Future? The Database Debate*, 2003 DUKE L. & TECH. REV. 22; Amar A. Hasan, *Sweating in*

spond to particular types of information problems. Patent law is primarily concerned with supporting private R&D incentives in order to foster useful technical change. Trade secrecy has largely been concerned with supporting ethical business practices, including regulation of commercial espionage.[50] While intellectual property law has expanded, it has not altered the surrounding legal fabric regarding transparency and accuracy, fair process, and avoidance of harm. Only if we believed that it is either unnecessary or hopeless to try to manage the quality of technical change would we value innovation over health and safety, accurate disclosure, and fair process.[51]

A. Patent Law and Information Diffusion

Patent law aims to encourage private investment in research and development and to support the use of information.[52] The classic formulation of patent law as a response to

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Europe: The European Database Directive, 9 COMP. L. REV. & TECH. J. 479 (2005); J.H. Reichman & Pamela Samuelson, *Intellectual Property Rights in Data?*, 50 VAND. L. REV. 51 (1997); NATIONAL RESEARCH COUNCIL, OPEN ACCESS AND THE PUBLIC DOMAIN IN DIGITAL DATA AND INFORMATION FOR SCIENCE—PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM (Julie M. Esanu and Paul F. Uhlir, eds. 2004); NATIONAL RESEARCH COUNCIL, BITS OF POWER—ISSUES IN GLOBAL ACCESS TO SCIENTIFIC DATA (1997).

50. The notion of a trade secret has been incorporated into numerous contexts whenever businesses seek to control valuable commercial information. *See* discussion *infra* Part II.B.

51. As a society, we are not so pessimistic. The post-World War II experience with regulation, while imperfect, suggests that transparent market processes, supported by robust regulatory monitoring, are a positive influence on technical change. *See* Douglas A. Kysar, *Law, Environment, and Vision*, 97 NW. U. L. REV. 675 (2003) (discussing contribution of ecological economics to understanding the interaction of technology and economic activity). However, our culture is imbued with technological optimism—the view that innovation will solve any and all of society's difficulties. *See* James E. Krier & Clayton P. Gillette, *The Un-easy Case for Technological Optimism*, 84 MICH. L. REV. 405, 426 (technological optimism is based "on a package of considerations none of which is sure to materialize . . ."). The culture is also imbued with technological determinism—the belief that innovation inexorably follows a narrow path that cannot be altered. *See* ANDREW W. FEENBERG, CRITICAL THEORY OF TECHNOLOGY 122 (1991) ("The dominant view of modernization is based on the deterministic assumption that technology has its own autonomous logic of development.").

52. The Supreme Court has summarized the functions of the patent system:

> First, patent law seeks to foster and reward invention; second, it promotes disclosure of inventions to stimulate further innovation and to permit the public to practice the invention once the patent expires; third, the stringent requirements for patent protection seek to assure that ideas in the public domain remain there for the free use of the public.

market failure in information production posits that the producer of knowledge has little control over its dissemination and, thus, little ability to recover her investment in it. Patent law addresses the investment disincentives created by the ease of copying and re-use by granting a period of exclusive control over information use. 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.[53] Intellectual property law's "monopoly" award to the first inventor slows the process of imitation, increases the costs of copying, and facilitates licensing, so innovators have a chance to recoup their investments.

This model oversimplifies the situation, however. 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, cotton gin, automobile, penicillin, radio, and computer.[54] The "heroic theory of

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Aronson v. Quick Point Pencil Co., 440 U.S. 257, 262 (1979) (summarizing the holding of *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470 (1974)).

53. *See* KENNETH ARROW, ECONOMIC WELFARE AND THE ALLOCATION OF RESOURCES FOR INVENTION, IN THE RATE AND DIRECTION OF INVENTIVE ACTIVITY 609–25 (1982). Recognition of this problem predates modern economics. In 1623, the English Parliament passed the Statute of Monopolies to provide incentive activity. *See* Shawn Kolitch, *The Environmental and Public Health Impacts of U.S. Patent Law: Making the Case for Incorporating the Precautionary Principle*, 36 ENVTL. L. 221, 234–35 (2006). The United States Constitution empowers Congress to grant "for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries," in order to promote "the Progress of Science and useful Arts." U.S. CONST. art. I, § 8.

Another way to conceptualize legal protection for ideas and inventions is to view it as preventing the unfair use of original labor by "free riders." This argument essentially supports property-like entitlements to information. "Property" characterizations of intellectual property and trade secret interests have generally been controversial. *See* Michael A. Carrier, *Cabining Intellectual Property Through a Property Paradigm*, 54 DUKE L.J. 1 (2004) (accepting the transformation of intellectual property into property law and proposing an analysis and framework to manage the change); Michael H. Davis, *Patent Politics*, 56 S.C. L. REV. 337 (2004); Edward J. Janger, *Privacy Property, Information Costs, and the Anticommons*, 54 HASTINGS L.J. 899 (2003); Mark A. Lemley, *Property, Intellectual Property, and Free Riding*, 83 TEX. L. REV. 1031 (2005); *see also* discussion *infra* notes 95–103.

54. NATHAN ROSENBERG, INSIDE THE BLACK BOX—TECHNOLOGY & ECONOMICS 55–56 (1982). Individual technological advances seldom stand alone; they almost always connect economically and intellectually to earlier advances and to other related technologies. *See* RICHARD R. NELSON, HIGH TECHNOLOGY POLICIES—A FIVE NATION COMPARISON 5–6 (1984).

invention" continues to shape the law's responses to the problem of information allocation, but the actual dynamics are much more complex.[55]

Inventions evolve out of existing stocks of knowledge that have concrete spatial and temporal limitations and potential. Information about an innovation is valuable in its native "topography," and other firms and researchers try to acquire it.[56] Leading innovative industries produce useful externalities for connected industries. Much of this happens incrementally and through collaboration. As advances fan out, firms that are well positioned can exploit new information before competitors do.[57]

Patent law provides a degree of transparency about new technical developments. Legal protection that is too strong delays access to innovations by competitors who may contribute important improvements, as well as new technologies.[58] The key concern in patent law today is finding the right amount of control and the best location for legal entitlements in the stream of technical change, in order to optimize support for early or original investment and also for later innovation.[59] Intellectual property calibrates control over information in order to encourage a stream of useful research.

Many economists have reservations about the amount of control over information that patents grant to private actors.

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55. JAMES BOYLE, SHAMANS, SOFTWARE & SPLEENS: LAW AND THE CONSTRUCTION OF THE INFORMATION SOCIETY (1996) (explaining the key role of the "author" metaphor in smoothing over the contradictions inherent in copyright law). *Id.* at 108–18.

56. RICHARD R. NELSON & SIDNEY G. WINTER, AN EVOLUTIONARY THEORY OF ECONOMIC CHANGE 229 (1982).

57. PAUL STONEMAN, THE ECONOMIC ANALYSIS OF TECHNOLOGY POLICY 51 (1987); PAUL STONEMAN, THE ECONOMIC ANALYSIS OF TECHNOLOGICAL CHANGE 65–67 (1983). Stoneman describes the literature on diffusion in chapters 5–10 of *The Economic Analysis of Technology Policy* and chapters 6–8 of *The Economic Analysis of Technological Change.*

58. *See* WILLIAM D. NORDHAUS, INVENTION, GROWTH, AND WELFARE: A THEORETICAL TREATMENT OF TECHNOLOGICAL CHANGE (1969); Richard R. Nelson, *Assessing Private Enterprise: An Exegesis of Tangled Doctrine*, 12 BELL J. OF ECON. 93, 93–111 (1981).

59. Boyle, *supra* note 55, at 35–46 (providing an analysis of the tensions inherent in different roles allocated to information in economics); *see* Edmund W. Kitch, *The Law and Economics of Rights in Valuable Information*, 9 J. LEGAL STUD. 683 (1980); Edmund W. Kitch, *Nature and Function*, *supra* note 18 (prospecting theory of patents places coordinating role early in innovation process); Robert P. Merges & Richard R. Nelson, *supra* note 18 (competition among patentees downstream in innovation is generally likely to yield a better result than broad singular control by early patentee).

Information is so productive that too much private control results in lost opportunities for others to use it. Patents make some information public, but they also delay active use of the information covered by the patent. Intellectual property law is committed to facilitating information distribution. Too much control frustrates this aim.[60] Patents pose a dilemma, precisely because information diffusion is so important to the innovation process.

In some situations, firms will prefer to keep information secret rather than seek a patent and publish the supporting documents. The traditional view of this tradeoff sees patents as difficult to enforce—possibly entailing costly litigation. Secrecy is flexible, perpetual as long as secrecy is maintained and seemingly cheap. However, its costs include expenditure on security and symbols of security, restrictions on employees and the employment relationship, and risks in licensing the use of the secrets. Nonetheless, at certain points in an innovation process, secrecy may be useful.[61] Indeed, as discussed below, innovations are increasingly managed though a combined strategy of secrecy and patents.

Because of its tendency to lead to wasteful duplication and lack of coordination, secrecy has few defenders among economists.[62] Steven Cheung has pointed out that the availability of

60. The tension between control and access is elaborated in a large ongoing debate. *See, e.g.*, Yochai Benkler, *Intellectual Property and the Organization of Information Production*, 22 INT'L REV. L. & ECON. 81, 98–99 (2002) (arguing strong intellectual property rights tend not to encourage increase in aggregate information production, but lead to commercialization, concentration, and homogenization of information production); Brett Frischmann, *Innovation and Institutions: Rethinking the Economics of U.S. Science and Technology Policy*, 24 VT. L. REV. 347 (2000) (critiquing underpinnings of current linear theory of innovation and the law's focus on addressing appropriability concerns, to the exclusion of other institutional mechanisms); Arti K. Rai & Rebecca Eisenberg, *Bayh-Doyle Reform and the Progress of Biomedicine*, 66 LAW & CONTEMP. PROBS. 289 (2003) (describing the increasingly proprietary character of university-based biomedical research and its potential for undermining progress in this field).

61. The dominant explanation for the role of secrecy in innovation is that without the exclusivity achieved through secrecy, a useful product that does not meet the strict standards of the patent law may not be viable. Some kind of legal protection is required to allow limited sharing of this kind of information; otherwise, hoarding of information will result. For a discussion of the relationship between patent law and trade secrecy, see MELVIN F. JAGER, TRADE SECRETS LAW §§ 134 at 1:9–:15, 10:2–:5, 11:2 (2006); WRIGHT & GRAHAM, *supra* note 1, at § 5642; Lyndon, *supra* note 1.

62. 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 research-

a legal secrecy option will tend to distort research incentives, because industrial processes that can be protected by secrecy will be favored.[63] He argues that this will compound the drag on diffusion that secrecy already creates. A cumulative result may be that technological opportunities are bypassed or delayed and that pockets of stagnation develop.[64] "Secrecy and efficient use of knowledge are inimical."[65]

Usually firms are not entirely dependent on either patents or secrecy because they have other strategies for profiting from their investment in information.[66] These strategies include exploitation of lead time, moving rapidly down the learning curve, and utilizing complementary capabilities (sales or service efforts and manufacturing). Firms in most industries use all of the available strategies to one degree or another.[67] While

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ers. Steven Cheung, *Property Rights in Trade Secrets*, 20 ECON. INQUIRY 40, 49 (1982). Cheung argues that secrecy obstructs the spread of new information and dissipates economic rents to a much greater degree than does the patent system. He identifies four types of losses inherent in secrecy: (1) the costs of industrial espionage, (2) the costs of imitation, (3) the costs of potential litigation, and (4) the costs of unnecessarily delayed research. *Id.* at 47–49. *See* Lyndon, *supra* note 1, at 14–15 (describing the literature on secrecy and efficiency research).

63. *See* Cheung, *supra* note 62, at 47–49.

64. See Harvey Brooks, *The Typology of Surprises in Technology, Institutions, and Development, in* SUSTAINABLE DEVELOPMENT OF THE BIOSPHERE 325–50 (William C. Clark & R.E. Munn eds., 1982).

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

66. Richard Levin et al., *Appropriating the Returns from Industrial Research and Development, in* BROOKINGS PAPERS ON ECONOMIC ACTIVITY 783 (1987) (showing that industries vary significantly in the rate of patents generated by R&D dollars invested). *See also* Lyndon, *supra* note 1, at 17–19.

67. Reverse engineering, independent R&D, and licensing were all rated fairly highly in Levin's study as means of determining a rival's technology. Levin, *supra* note 66, at 805–07. Another reported learning mechanism was interpersonal communication, e.g., publications, technical meetings, informal conversations, and hiring away employees. *Id.* Levin suggests that there may be clusters of industries using different types of learning approaches. *Id.* at 807. 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. *Id.* at 806–08. Where this is the case, the key to making use of new advances is good information connections. Informal know-how trading appears to be extensive and firms may go so far as to train rivals' employees. ERIC VON HIPPEL, SOURCES OF INNOVATION 76–79 (1988). NELSON & WINTER, *supra* note 56, at 2–3 (exploring the possibilities of modeling this behavior).

A recent study supports the conclusion that secrecy incentives will be widespread; most companies will rely on secrecy from time to time. Wesley M. Cohen, Richard R. Nelson, & John P. Walsh, *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Firms Patent (or Not)*, Working Paper 7552,

contests over disputed information will elicit claims of legal entitlement, arguments of dire outcomes are almost certainly overblown. Legal entitlements are a factor—a ball in play—but usually not the foundation of a company's value.

Some current research elaborates on the topography metaphor and applies the lesson learned from the "tragedy of the commons" to intellectual property issues.[68] The commons model was proposed by Garrett Hardin as a way of seeing the dynamics of environmental destruction resulting from excessive use of a resource, where access is unconstrained by appropriate legal limits.[69] The "tragedy" of the commons has usually been seen as the result of too little private control over resources, but the opposite problem may occur. There may be an "anti-commons" in which there is too much control over a resource, and it is therefore underutilized. In an anti-commons, property or property-like entitlements densely surround a resource and prevent its efficient use by those who do not hold access rights and cannot purchase them.[70]

Information scarcity and access issues are analogous to a physical commons. The anti-commons model may be particularly applicable to information resources, which are very flexible and productive. As Parts II.B and II.C, *infra*, will describe, courts, legislatures, and agencies have been under pressure to expand nondisclosure privileges. Indeed, it appears that gradually, the law has been making it harder to gain access to

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10 NAT'L BUREAU OF ECON. RES. (2000), http://www.nber.org/papers/w7552. However, secrecy may be short-lived. *Id.*

68. Garrett Hardin, *The Tragedy of the Commons*, 162 SCIENCE 1243 (1968).

69. *See id.*

70. For more on the commons, anti-commons, and semi-commons, see James Boyle, *Forward: The Opposite of Property*, 66 LAW & CONTEMP. PROBS. 1 (2003); Michael A. Heller, *The Tragedy of the Anticommons:Property in the Transition from Marx to Markets*, 111 HARV. L. REV. 621 (1999); Michael A. Heller & Rebecca Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCIENCE 698 (1998); Charlotte Hess & Elinor Ostrom, *Ideas, Artifacts, and Facilities: Information as a Common-Pool Resource*, 66 LAW & CONTEMP. PROBS. 111 (2003); Robert A. Heverly, *The Information Semicommons*, 18 BERKELEY TECH. L.J. 1127 (2003). For responses to the "anticommons" thesis, see David E. Adelman, *A Fallacy of the Commons in Biotech Patent Policy*, 20 BERKELEY TECH L.J. 985 (2005); Abraham Bell & Gideon Parchomovsky, *Of Property and Antiproperty*, 102 MICH. L. REV. 1 (2003); Reza Dobadj, *Regulatory Givings and the Anticommons*, 64 OHIO ST. L. J. 1041 (2003); R. Polk Wagner, *Information Wants to be Free: Intellectual Property and the Mythologies of Control*, 103 COLUM. L. REV. 995 (2003). For an application of this perspective to the emerging nanotechnology applications, see Mark A. Lemley, *Patenting Nanotechnology*, 58 STAN. L. REV. 601 (2005).

EHS data. Access rules may be incrementally constructing a situation that is like an "anti-commons" in which nondisclosure privileges prevent efficient utilization of EHS data.

EHS refinements are an important kind of "follow-on" development. When the law constricts information flow to EHS assessment, society loses opportunities to improve technologies in use and also bears the cost of continuing investment in inadequate technologies.[71] Also, if access and transparency are insufficient, emerging technologies may be misunderstood and their negative dimensions ignored by market and regulatory risk management systems.[72] Confusion and dead spaces in the available risk information will be more likely.

Intellectual property law attempts to support human creativity. In patent law, the goal is "progress" through innovation or useful technical change.[73] The specific character of the progress we may achieve is open, but it is useful to remember that patent law's basic goal is to improve the quality of our technological options. Health, safety and environmental feedback are prerequisites to such improvement. Indeed, risk management is a strong rationale for patent law's commitment to disclo-

71. Continued investment in technologies may impose substantial EHS costs over time. Moreover, those who control existing technologies are in a position to control the ways that the costs are perceived. *See* Brooks, *supra* note 64, at 337–43. Waste disposal and management of residuals were not perceived as barriers to further market expansion. Automobiles, pharmaceuticals, pesticides, electric power generation, commercial air transport, industrialized agriculture, and many other areas appear to have similar patterns, wherein successful innovation over an extended period becomes self-limiting because of the failure to enlarge the innovation agenda sufficiently quickly, particularly in relation to externalities. *Id.* at 337–38. *See also* Teresa Moran Schwartz, *The Role of Federal Safety Regulations in Products Liability Actions*, 41 VAND. L. REV. 1121, 1160–69 (1988) (describing industry influence over regulatory agencies and placing this in the context of the tort reform debate).

72. *See, e.g.*, Lynn L. Bergeson & Bethami Auerbach, *The Environmental Regulatory Implications of Nanotechnology*, 35 ENV'T REP. 840 (2004) (surveying environmental laws that may apply to nanotechnology); Brian McShane, *Nanotechnology: Is There Cause for Concern?*, PROF. SAFETY, May 2006, at 28; Michael A. Ven Lenete, *Building the New World of Nanotechnology*, 38 CASE W. RES. J. INT'L L. 173 (2006) (describing government actions to stimulate nanotechnology research); *Environmental Groups Want Nanotech Sunscreens Pulled from Market*, ENV'T NEWS NETWORK, May 17, 2006, http://enn.com/archive.html?id=1375&cat=biz; *Researchers Urge More Safety Research to Boost Nanotechnology*, CQ Green Sheets Environmental Policy, Nov. 17, 2005.

73. For the constitutional language relating to patent law, *see supra* note 53. The meaning of "progress" in this context is, of course, controversial. *See, e.g.*, Eileen M. Kane, *Patent Ineligibility: Maintaining a Public Domain*, 80 ST. JOHN'S L. REV. 519 (2006).

sure.[74]

B. *The Common Law of Trade Secrets and Access to Information*

Trade secret law is the original and still dominant body of law on commercial confidentiality.[75] It establishes liability for misappropriation of confidential information and enables the enforcement of licensing and employment contracts with nondisclosure clauses. However, there are substantial limits to the entitlement. Trade secret law applies only to "trade" information that is "secret" within the meaning of the law. Also, it provides a cause of action only against those who act wrongfully to acquire the information. Moreover, it recognizes general public policy limits on its application.

The Restatement (First) of Torts articulates the courts' view of trade secrecy as it took shape in the mid-nineteenth century.76 Published in 1939, this Restatement has been the leading treatment of trade secret law for many years and contains the core definition of a trade secret: a formula or pattern or any information that is used in business and furnishes a competitive advantage.[77] The definition makes clear that the law is concerned with information that is part of commercial and production processes. The Uniform Trade Secrets Act (UTSA), published in 1979 and enacted by most state legislatures, widened the definition of trade secrecy, while the 1995 Restatement (Third) of Unfair Competition further expanded the definition.[78] However, the newer treatments did not make

74. Rochelle C. Dreyfuss, *Dethroning Lear: License Estoppel and the Incentive to Innovate*, 72 VA. L. REV. 677, 736 (1986) (secrecy prevents public from scrutinizing the harmful effects of inventions).

75. Trade secret law became a recognizable common law doctrine by the mid-nineteenth century, formed from a blend of legal principles and doctrines, including the fiduciary principles of tort law, elements of contract and property law, equity, and the doctrine of unjust enrichment. *See* JAGER, *supra* note 61, at §§ 4:1–:4; Lyndon, *supra* note 1, at 4–5.

76. RESTATEMENT (FIRST) OF TORTS § 757 (1939).

77. *Id.*

78. According to the Restatement of Torts, "any formula, pattern, device, or compilation of information which is used in one's business" can be the subject of a trade secret. *Id.* The idea that trade secrecy applies only to information about physical processes that are in continual use in a business continues to exert some influence on the law. The UTSA definition does not explicitly include this requirement; it states that the subject matter may be "information, including a formula, pattern, compilation, program, device, method, technique or process." Uni-

dramatic changes, and, because of the long influence of the Restatement (First) of Torts, the later treatments have largely been fit into its frame.

Secrecy is the main formal requirement for the entitlement, but it is loosely applied and information need not be absolutely secret to be covered.[79] Indeed, trade secrets cannot be completely secret because the function of the doctrine is to support norms of confidential sharing in business relationships. To meet the standard for secrecy, the plaintiff generally need only show some level of investment to keep the pertinent information out of general circulation.

Loss of a secret is actionable, but there is no entitlement *vis-a-vis* innocent parties or those who reverse engineer a product and uncover information. Courts enforce the law against those who wrongfully obtain the secret information,[80] as the central function of the doctrine has been to provide support for ethical norms in commerce.[81] The law thus emphasizes protection against bad behavior, such as overreaching, lack of trust worthiness, or theft. It also preserves incentives to dis-

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form Trade Secrets Act § 1(4) (1985). The Restatement (Third) of Unfair Competition defines a trade secret as "any information that can be used in the operation of a business or other enterprise and that is sufficiently valuable and secret to afford an actual or potential economic advantage over others." RESTATEMENT OF THE LAW (THIRD) OF UNFAIR COMPETITION, Ch. 4, Appropriation of Trade Values, Topic 2, Trade Secrets § 39 (1995).

79. "Secrecy" is relative. JAGER, *supra* note 61, at § 5:15. One need only prove that the data has not been generally disclosed; some courts have held that as long as most firms in the industry are not aware of the information—i.e., so that it is not the "common property" of the industry—it can still be treated as a trade secret. *Id.*; Lyndon, *supra* note 1, at 4–10.

80. Thus, defendants are liable if they acquire secrets by improper means, including illegal activities, fraud, or extraordinary efforts to overcome a firm's efforts to keep a secret. JAGER, *supra* note 61, at § 5:9. Legitimate means include reverse engineering, purchase by innocent third parties, and disclosure by one not under an obligation to maintain confidentiality.

81. The tort theme—breach of confidence and fiduciary duty—has been the basis of recovery in the absence of a contract. The usual case has involved the plaintiff's former employees, now competitors. *See, e.g.*, E. I. DuPont DeNemours Powder Co. v. Masland, 244 U.S. 100, 102 (1917); Eastman Co. v. Reichenbach, 47 N.Y. St. Rep. 435 (1892), aff'd, 29 N.Y.S. 1143 (1894). The Restatement of Torts 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 (FIRST) OF TORTS § 757. Most courts have accepted this principle as the foundation and core of trade secret law. *See* JAGER, *supra* note 61, at § 4:2 (describing the tort theory as "by far the most popular" theory of trade secret law, that is, "injury caused by the disclosure or use of a trade secret in breach of a confidential relationship").

cover information, since entitlement to data can be acquired through legitimate means. Both the UTSA and the 1995 Restatement continue the model of trade secret law as a set of norms for market rivals.

Trade secret concepts can be incorporated into a variety of legal settings. These adaptations include confidentiality clauses in employment or other contracts,[82] limitations on discovery in litigation,[83] and exemptions to statutory reporting requirements.[84] In addition, some statutes now provide criminal penalties for misappropriation of trade secret information.[85]

The use of employment contracts with nondisclosure clauses has proliferated in recent years. Courts are reluctant to invalidate contract provisions, as they are generally thought to be freely chosen. Yet there are limits on the right to contract. If an employment contract includes limits on competition and disclosure that are too broad, courts may strike the limits down as restraints of trade and against public policy. Courts have disapproved nondisclosure provisions when they have conflicted with employees' legitimate interest in freedom to work.[86]

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82. *See infra* note 86 and accompanying text.

83. For discussion of the merits of the use of protective orders in civil discovery, see JAGER, *supra* note 63, at §§ 5:32–:45; WRIGHT & GRAHAM, *supra* note 1, at 396–414; RICHARD A. ZITRIN, ROSCOE POUND INSTITUTE, OPEN COURTS WITH SEALED FILES: SECRECY'S IMPACT ON AMERICAN JUSTICE (2000); Albert Louis Chollet III, *Enabling the Gaze: Public Access and the Withdrawal of Tennessee's Proposed Rule of Civil Procedure 1A*, 36 U. MEM. L. REV. 695 (2006); Laurie Kratky Dore, *Secrecy By Consent: The Use and Limits of Confidentiality in the Pursuit of Settlement*, 74 NOTRE DAME L. REV. 283 (1999); Givelber & Robbins, *supra* note 14; Anne Y. Shields, *The Utility of Disclosure as a Reform to the Pretrial Discovery Process*, 67 ST. JOHN'S L. REV. 907 (1993); David S. Sanson, *The Pervasive Problem of Court-Sanctioned Secrecy and the Exigency of National Reform*, 53 DUKE L.J. 807 (2003); Jillian Smith, *Secret Settlements: What You Don't Know Can Kill You!*, 2004 MICH. ST. L. REV. 237 (2004). *But see* Arminda Bradford Bepko, *Public Availability or Practical Obscurity: The Debate Over Public Access to Court Records on the Internet*, 49 N.Y.L SCH. L. REV. 967 (2004–2005); Jordana Cooper, *Beyond Judicial Discretion: Toward a Rights-Based Theory of Civil Discovery and Protective Orders*, 36 RUTGERS L.J. 775 (2005).

84. *See infra* Parts II.C.1–2.

85. *See infra* Part II.C.3.

86. Carol M. Bast, *At What Price Silence: Are Confidentiality Agreements Enforceable?*, 25 WM. MITCHELL L. REV. 627 (1999) (describing legal issues related to whistleblowers in the context of tobacco history); Pamela H. Bucy, *Information as a Commodity in the Regulatory World*, 39 HOUS. L. REV. 905 (2002) (describing the history of law's reliance on insiders' information in detecting and correcting wrongdoing); Alan E. Garfield, *Promises of Silence: Contract Law and Freedom of Speech*, 83 CORNELL L. REV. 261 (1998) (arguing in favor of regulation of contracts

Because of its many applications in different areas of law, it is hard to place trade secrecy within the broader framework of legal theory.[87] In application, a trade secret sometimes has characteristics of conventional property, and trade secrecy has also been linked with both privacy and intellectual property law. The privacy analogy is not often invoked today,[88] but trade secret law's role in intellectual property law has grown.[89]

In the 1974 decision in *Kewanee Oil Co. v. Bicron Corp.*, the Supreme Court held that federal patent law does not preempt state trade secret law.[90] Chief Justice Burger, writing for the majority, spoke of a right to maintain secrecy that is inherent in the act of originating ideas. He also asserted that trade

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requiring nondisclosure); Edmund W. Kitch, *The Expansion of Trade Secrecy Protection and the Mobility of Management Employees: A New Kind of Problem for the Law*, 47 S.C. L. REV. 659 (1996); Terry Moorehead Dworkin & Elletta Sangrey Callahan, *Buying Silence*, 36 AM. BUS. L.J. 151 (1998) (discussing and arguing for greater formalization of public policy limitations on nondisclosure agreements); Stefan Rutzel, *Snitching for the Common Good: In Search of a Response to the Legal Problems Posed by Environmental Whistleblowing*, 14 TEMPLE ENVTL. L. & TECH. J. 1 (1995) (surveying law affecting whistleblowers revealing environmental infractions of employers).

However, the doctrine of inevitable disclosure expresses the pressure to move to property-like limitations. *See* Nathan Hamler, *The Impending Merger Of The Inevitable Disclosure Doctrine And Negative Trade Secrets: Is Trade Secrets Law Headed In The Right Direction?*, 25 J. CORP. L. 383 (2000).

87. *See* WRIGHT & GRAHAM, *supra* note 1, at §5642; Robert G. Bone, *A New Look at Trade Secret Law: Doctrine in Search of Justification*, 86 CAL. L. REV. 241(1998); Vincent Chiappetta, *Myth, Chameleon, or Intellectual Property Olympian? A Normative Framework Supporting Trade Secret Law*, 8 GEO. MASON L. REV. 69 (1999); Lyndon, *supra* note 1; Michael P. Simpson, *The Future of Innovation—Trade Secrets, Property Rights, and Protectionism—An Age-Old Tale*, 70 BROOK. L. REV. 1121 (2005) (describing the origins of trade secrecy in the common law of capture, its sojourn in tort law and its recent links to intellectual property); Steven Wilf, *Trade Secrets, Property, and Social Relations*, 34 CONN. L. REV. 787 (2002).

88. For instance, in *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470 (1974), Chief Justice Burger suggested that trade secret law's role in discouraging industrial espionage could be understood as a kind of privacy protection. *Id.* at 487. Other authors also have mentioned the idea, buts its usefulness is limited. *See* discussion in Lyndon, *supra* note 1, at 40–42; WRIGHT & GRAHAM, *supra* note 1, at § 5642.

89. *See* discussion *supra* Part I.B. Trade secret law also appears to be spreading globally, through international intellectual property law. *See* J.H. Reichman, *Universal Minimum Standards of Intellectual Property Protection Under the TRIPS Component of the WTO Agreement*, 29 INT'L LAW 345, 377–78 (1995) (TRIPS agreement is the first international convention to expressly require member countries to protect trade secrets); Rochelle Cooper Dreyfuss, *TRIPS Round II: Should Users Strike Back?*, 71 U. CHI. L. REV. 21 (2004) (arguing that TRIPS provisions are too restrictive from information access point of view).

90. *Kewanee*, 416 U.S. at 470.

secrecy enhances the patent system by supplementing it or by increasing its enforceability. At the time, the majority of the Court thought that secrecy would have little effect on the operation of the patent system, since secrecy seemed unlikely to become a favored business strategy.[91] However, this expectation turned out to be mistaken. While research in the 1980s suggested that secrecy was a marginal competitive strategy, the use of secrecy has increased dramatically since then.[92] Recent research suggests that use of both patents and secrecy is increasing as they become part of portfolios of entitlements that are used as bargaining chips in efforts to participate in or control markets and technologies.[93] This role is quite different from the genius inventor metaphor that underlies much of the rights-based rhetoric on patents and secrecy.

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91. Since a secret may be kept indefinitely, legal protection of trade secrets raises the question of compatibility with patent law, which requires the *quid pro quo* of publication. *Id.* at 484. The *Kewanee* holding rests on the idea that most information that is kept secret will not be patentable anyway since the patent system offers better protection to the inventor. Justices Marshall, Douglas, and Brennan questioned this key assumption, and Justice Douglas, dissenting, wrote that the decision fundamentally misinterpreted the Patent Clause. *Id.* at 494–99. *See also* WRIGHT & GRAHAM, *supra* note 1, at § 5642. The literature on innovation, *supra* at notes 23–40, also suggests strongly that the role of secrecy in encouraging innovation is ambiguous at best.

92. In 1987, Levin found that secrecy is used mainly in certain industries, but these may be important to health and the environment, e.g., chemicals. Levin et al., *supra* note 66, at 10 n.21. In 2000, Cohen found that the use of secrecy has increased dramatically since the 1980. Cohen et al., *supra* note 67, at 24–25.

93. Professor Dreyfuss explains the patenting strategy of large commercial enterprises that "accumulate patents on . . . incremental improvements—partly to maintain exclusivity at the edge, but also on a theory of mutually assured destruction. That is, if every competitor in a field knows that the others are also obtaining patents, there is less of a tendency to engage in patent warfare. Assertions may not be made at all; when they do occur, disputes are settled by cross licensing." Rochelle Dreyfuss, *Protecting the Public Domain in Science: Has the Time for an Experimental Use Defense Arrived?*, 46 ARIZ. L. REV. 457, 468 (2004) (noting that since universities generally do not have deep patent portfolios, they are at a disadvantage in this game and when sued may be forced to pay large sums); Robert P. Merges, *One Hundred Years of Solicitude: Intellectual Property Law, 1900–2000*, 88 CAL. L. REV. 2187, 2221 (2000) (describing the emergence of the patent portfolio as a way to develop "blocking positions" to counter rivals' strengths in new technologies). These strategies have grown in importance and play a substantial role in intellectual property litigation. *See* Cohen et al., *supra* note 67, at 25–26; Jean O. Lanjouw & Mark Shankerman, *Enforcement of Patent Rights in the United States*, *in* PATENTS IN THE KNOWLEDGE-BASED ECONOMY 145–79 (Wesley M. Cohen & Stephen A. Merrill, eds. 2003). *See also* Gideon Parchmovsky & R. Polk Wagner, *Patent Portfolios*, 154 U. PA. L. REV. 1 (2005) (proposing a theoretical analysis of patent law that takes account of an individual patent's role within larger portfolios).

Trade secrecy is now widely seen as having two functions: support for business ethics and limited support for innovation. The place of trade secrets in intellectual property law is problematic, however. Secrecy tends to foster delay in the diffusion of technical innovations. For this reason the law of trade secrecy has been consciously "leaky," balancing control and access in a way that is analogous to patent law's approach.[94]

The idea that trade secret information is "property" in the conventional sense has been offered to support a privilege to keep EHS information secret.[95] Full analysis of property reasoning as applied to risk information is beyond the scope of this article, but property reasoning has been a theme in trade secret cases.[96] A trade secret is strange property, indeed, as it can be taken by anyone who uses the right means. As Justice Holmes states, "[t]he word property as applied to trademarks and trade secrets is an unanalyzed expression of certain secondary consequences of the primary fact that the law makes some rudimentary requirements of good faith."[97] Wright and Graham suggest that while some writers and courts describe the interest as property, they do not seem to mean that the dominant theory for protection of trade secrets is property. Rather, there is a protectable interest in trade secrets, and it can be characterized as a form of property for a number of purposes, such as taxation, licensing and inheritance. Wright and Graham note

94. Pamela Samuelson & Suzanne Scotchmer, *The Law & Economics of Reverse Engineering*, 111 YALE L.J. 1575 (2002). Developing information technologies have put pressure on the traditional position of reverse engineering in trade secret law, which is an important dimension of the law.

95. *See*, MELVIN F. JAGER, TRADE SECRETS LAW (1985); ROGER M. MILGRIM, MILGRIM ON TRADE SECRETS § 1.01 (1999).

96. As information has become more central to the economy, trade secrets have been claimed as a property interest. However, they are not property in the conventional or complete sense. *See, e.g.*, WILLIAM M. LANDES & RICHARD A. POSNER, THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW, 354–71 (2003) (discussing functions of trade secret law and ways it is not "property" law); Robert G. Bone, *A New Look at Trade Secret Law: Doctrine in Search of Justification*, 86 CAL. L. REV. 241 (1998); James Boyle, *The Opposite of Property*, 66 LAW & CONTEMP. PROBS. 1 (2003) (outlining the debates in symposium on the concept of the public domain); Michael A. Carrier, *Cabining Intellectual Property Through a Property Paradigm*, 54 DUKE L.J. 1 (2004) (describing the "propertization" of intellectual property law and proposing ways of using traditional property limits to understand legal claims in this new context); Chiappetta, *supra* note 87; Mark A. Lemley, *Property, Intellectual Property, and Free Riding*, 83 TEX L. REV. 1031 (2005) (describing ways in which recent market failure and free rider analysis has distorted patent and copyright law); Lyndon, *supra* note 1; Wilf, *supra* note 87.

97. E.I. Dupont DeMours v. Masland, 244 U.S. 100, 102 (1917).

that "the fact that a trade secret is treated as property for these purposes does not mean that every other issue involving protection of trade secrets can be disposed of by calling it property."[98] Most of the scholarship agrees that property is not the appropriate model for trade secrecy.[99]

The Supreme Court's 1984 decision in *Ruckelshaus v. Monsanto* held that if a state protects the information in question as property, then it can be property for purposes of the Takings Clause of the U.S. Constitution.[100] At the same time, the Court held that the Clause only protects reasonable investment backed expectations and noted that businesses in arenas regulated for health and safety purposes would have an expectation of secrecy only if it had been expressly given by the government.[101] On the facts before it, the Court found that Congress had intended to protect commercial information only in the period specified by the statute.

In *Ruckelshaus*, the Supreme Court correctly recognized that EHS risk management is to be expected and generally has priority over commercial secrecy.[102] Extending trade secret law into the EHS risk management setting would enable camouflage efforts in ways trade secret law certainly does not contemplate. Even full-blown conventional property rights do not support the use of property to harm third parties or to avoid duties, such as warning of risks created by the property owner.

When courts and agencies accommodate expansive intel-

98. WRIGHT & GRAHAM, *supra* note 1, at § 5642.

99. William Landes & Richard A. Posner, *Some Economics of Trade Secret Law*, 5 J. ECON. PERSPECTIVES 61–72 (1991). *Contra* MILGRIM, *supra* note 95, at § 1.01; Richard A. Epstein, *The Constitutional Protection of Trade Secrets Under the Takings Clause*, 71 CHI. L. REV. 57 (2004) (arguing trade secrets should be handled within the mainstream of property law).

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

101. *See id.*; Frank H. Easterbrook, *The Court and the Economic System*, 98 SUP. CT. REV. 4 (1984); Lyndon, *supra* note 1; Pamela Samuelson, *Information as Property: Do Ruckelshaus and Carpenter Signal a Changing Direction In Intellectual Property Law?*, 38 CATH. U. L. Rev. 365 (1989).

102. Citing its own decision in *Westinghouse Electric Corp. v. United States Nuclear Regulatory Commission*, 555 F.2d 82 (3d Cir. 1977), and the Supreme Court's decision in *Ruckelshaus*, the Third Circuit has stated that trade secrets are not constitutionally protected from the regulatory process. *See* United Steelworkers of America v. Auchter, 763 F.2d 728, 739 (3d Cir. 1985) (rejecting arguments that OSHA's Hazard Communication Standard interfered with trade secrets, the court bluntly told OSHA that it need not be so cautious: "These cases suggest that a regulation requiring the disclosure even of formula or process information as a precondition for the sale of hazardous products for use in the workplace would be valid."). *See also* Lyndon, *supra* note 1, at 26–33.

lectual property analogies and property rights arguments, the larger implications of each case are not always apparent. Neither the equities nor the opportunity costs on each side are fully visible. Instead, the property claim tends to be central, reducing complex information dynamics to the question of whether the claimant has a "right" to the information.[103] In addition, property rights arguments tend to carry the gravitas of potential "takings." Yet, the takings doctrine rests on the rationale that society should not burden one or a few to benefit the many. Here, nondisclosure will generally result in the opposite effect: the many will be burdened for the benefit of the few.

In any case, in order to be covered by trade secret law, information must have several characteristics. First, the information must be "trade" information: that is, it must be commercial and have competitive value. This requirement assumes that the information's value is derived from the legitimate market as it is formally understood, not from the value of strategic behavior. Camouflage to avoid regulatory or other legitimate scrutiny is not protected.

Second, trade secret information must be secret. A secret holder can do a variety of things to prevent the secret's release, but once the information is out, either as data or as embodied in a product or other physical form that can be reverse engineered, it is not "secret" anymore. Pollution and other externalities that cause risks to third parties are not "secret" within the meaning of trade secret law. Trade secret law is concerned with the conduct of rivals in relation to each other, not with non-market relationships. It was developed to provide a mechanism for resolving conflicts over expectations of confidentiality arising from contracts or fiduciary relationships in business. Its goal is to support collaboration in business and it thus expresses norms of fair dealing. Trade secret law does not contemplate keeping secrets from people put at risk because they do not know the identity of exposures that secret holders impose on them.

Even when EHS data is the kind of information that would be covered by trade secret law under other circumstances, risk creating behavior effectively releases or abandons information that describes the risk. It is outside the narrow protected area

103. *See supra* Part II.A.

of the business processes and relationships that the law aims to cover. Perhaps "secrecy is being invoked more frequently because dispersed pollution is gradually being more fully described. New initiatives to set up national health tracking systems and to deploy inexpensive bio-monitoring equipment will take to a new level the process of "reverse engineering" the EHS effects of much risk creating behavior.[104]

It is at least inappropriate and also doctrinally inaccurate to invoke trade secret law to withhold information about activities that are neither commercial nor transactional, but refer to public acts and products that impose risks on strangers.[105] EHS data used in risk management is neither "trade" information nor "secret" within the meaning of the law. Indeed, the Restatement (Third) of Unfair Competition, 1995—the most recent statement of the law of trade secrets—specifies that the "public health and safety" may be a defense to a trade secret misappropriation claim.[106]

Even if the law were to support claims of secrecy based on an analogy to intellectual property, the legitimacy of any particular claim should depend its actual usefulness. The question would be: how close is the information to the frontier of innova-

104. *See infra* Part III.

105. How broadly should courts read the concept of "trade secrets" when using it in the context of federal evidentiary rules? *See* WRIGHT & GRAHAM, supra note 1, §§ 5642, 5644. Discussing the appropriate readings of "trade secrecy" in the context of federal evidentiary rules, Wright and Graham note that there should be a presumption against the applicability of the trade secrets privilege to scientific research or principles and point out that courts have been reluctant to apply the trade secrets concept to scientific research. *Id.* Further, they note the importance to science of an ethic of openness and suggest that courts could generalize a principle that the privilege should not be allowed whenever secrecy is not in the public interest; this finds support in decisions holding that one cannot assert trade secret protection for health and safety information. *Id.* (citing Public Citizen Health Research Group v. F.D.A., 704 F.2d 1280, 1288 (D.C. Cir. 1983)).

106. Compulsory licensing for health purposes has long been a part of patent law in this country and abroad. Today there is an intense international debate over the relationship between medicinal benefits and pharmaceutical patent profits. Compulsory licenses may have some application to the risk management context, though a full exploration of the topic is beyond the scope of this discussion. In any case, the history of limitations on patents for medical uses meshes with the express acknowledgement in the new RESTATEMENT OF UNFAIR COMPETITION that trade secret claims may be defeated by a public health or welfare defense. *See* Ruckelshaus v. Monsanto, 467 U.S. 986 (1984); Lori B. Andrews, *The Gene Patent Dilemma: Balancing Commercial Incentives With Health Needs*, 2 HOUS. J. HEALTH L. & POL'Y 65 (2002); William B. Lafferty, *Statutory and Ethical Barriers in the Patenting of Medical and Surgical Procedures*, 29 J. MARSHALL. L. REV. 891 (1996).

tion?[107] Time-limited claims of confidentiality concerning newly emerging science and knowledge may be compatible with innovation goals, but secrecy of risk information usually will not be. At the very least those claiming exception from disclosure should bear the burden of demonstrating the information's role in fostering useful technical change.

C. Statutory Disclosure Requirements and Compromised Access

This section describes statutory provisions that expressly concern public access to information in the possession of government agencies. In 1966, Congress enacted the federal Freedom of Information Act (FOIA), the overarching framework for regulatory disclosure law.[108] Regulatory programs that govern risk management in different industries also contain disclosure provisions. The justification for disclosure is greatest in this setting, where EHS risks are possible or have been identified and commercial camouflage incentives are at their most intense. Following FOIA, regulatory statutes use the term "trade secrets" to delineate commerce-based exceptions to disclosure requirements, and most have now added the category "confidential business information" (CBI).

Regulatory disclosure requirements vary depending on context-specific regulatory dynamics and statutory authorizations. For instance, the Food and Drug Administration (FDA) oversees the pharmaceutical and cosmetic industries, two relatively concentrated groups whose products often build on chemical formulae.[109] After taking an early position that it would not provide expansive protection of competitive information, the FDA reversed its posture. Today, however, the agency is embroiled in heated and difficult controversies over secrecy

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107. Trade secret law sets a less exacting standard than patent law. MILGRIM, *supra* note 95, § 8.02 [5]; *see infra* Part III.

108. FOIA has been copied by many states. It has been amended several times and most of the changes have expanded access. In 1996, Congress enacted the Electronic Freedom of Information Act, or E-FOIA, which makes more categories of information available to the public and provides for electronic request processes and disclosure. Pub. L. No. 104-231, 110 Stat. 3048 (codified at 5 U.S.C. §552 (Supp. II 1996)).

109. *See generally* JAMES T. O'REILLY, FOOD AND DRUG ADMINISTRATION § 22:5 (2d ed. 1993); Roberta Schugman & Leslie Shaw, *The Application of Trade Secret Protection to Safety and Effectiveness Data of Patented Drugs*, 16 U.C. DAVIS L. REV. 463 (1983).

in the drug context.

In the 1980s, the Occupational Safety and Health Administration (OSHA) and then the EPA instituted broad risk communication programs.[110] The EPA also has extended its use of information-based regulatory strategies beyond other agencies, using its web site to make available a wide range of information that it acquires through regulatory processes and statutory reporting requirements.[111] Also, Congress explicitly provides for citizen assistance in the EPA's enforcement of many environmental laws.[112] However, "data gaps" continue to undermine regulatory efforts, and the rules affecting information development and distribution have been continually contested.[113] In addition, to FOIA and specific regulatory authorizations, some statutes also provide for criminal penalties for unauthorized use of data. These laws are discussed below in Part III.C.3.

This section will use FOIA as an example to trace the development of basic disclosure rules. FOIA sets out a basic disclosure mandate to be followed by all federal agencies.[114] Agencies are to provide public access to all "agency records" or documents in their possession. This mandate is limited by a list of categories of information that agencies may withhold at their discretion. "Exemption 4," allows agencies to withhold "trade secrets and commercial or financial information obtained from a person and privileged or confidential."[115]

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110. *See* Lyndon, supra note 1, at 26–34 (describing promulgation of hazard communication rules and litigation that followed).

111. New systems have developed to organize and assist firms in meeting their EHS responsibilities. For instance, the International Standards Organization has developed environmental management systems and provides for compliance. *See, e.g.*, Christine Mikulich, *ISO 14000–14001, The Developing World's Perspective*, 17 TUL. ENVTL. L.J. 111 (2003). Environmental auditing and environmental management systems are part of a new culture of management. *See, e.g.*, REGULATING FROM THE INSIDE: CAN ENVIRONMENTAL MANAGEMENT SYSTEMS ACHIEVE POLICY GOALS? (Cary Coglianese & Jennifer Nash, eds. 2001) (describing the goal of reflexive law as encouraging responsible management through legal strategies that focus on the "self-referential" or adaptive capacities lingering in the firms that are subject to regulation); David Zlotlow, 30 ECOLOGY L.Q. 213 (2003) (reviewing REGULATING FROM THE INSIDE). *See* Eric W. Orts, *Reflexive Environmental Law*, 89 NW. U. L. REV. 1227, 1254–55 (1995).

112. *See* PERCIVAL ET AL., *supra* note 32, at 977–1034; William H. Rodgers, ENVIRONMENTAL LAW § 7:6 (2006).

113. *See supra* notes 35–40 and accompanying text.

114. 5 U.S.C. § 552(a) (2000).

115. 5 U.S.C. § 552(b). An early and thorough analysis of the problems that agencies face in implementing the commercial exemptions to FOIA's disclosure

1. Trade Secrecy Transplanted

Courts have read Exemption 4's use of the term "trade secrets" as a straightforward transplant of the common law definition. They usually apply the term narrowly, relying on the Restatement (First) of Torts, discussed above in Part I.B. However, even if construed narrowly, trade secrecy in the administrative context is not the same as it is in the common law. The difficulties of applying trade secret law in the risk assessment context are compounded by substitution of the administrative setting for the common law's adversarial adjudication.

In the common law context, a trade secrecy claim alleges misbehavior by the defendant. Many of the issues in a case revolve around the defendant's behavior in seeking and acquiring the information, the defendant's awareness of the plaintiff's intent to maintain secrecy, the plaintiff's past efforts to restrict the physical availability of the information, and the information's value in the industry. Litigating rivals provide evidence on these elements based upon their familiarity with the particular commercial rivalry. The value and secrecy of information can be verified best by firms participating in the industry.

Transplanting trade secrecy out of its native common law setting and into regulation eliminates the process that courts use to establish that a legitimate trade secret exists. In the common law, information on the key issues emerges from the contest between two rivals. In the regulatory context, the information dynamics are entirely different. Agencies have limited evidence with which to evaluate the trade secret status of information. An administrative agency can ask for evidence from the document submitter, but its evaluation of the response is necessarily limited. Agencies usually cannot contact the claimant's rivals—the most useful source for fact-checking—without risking disclosure.[116] Secrecy thus becomes a passive defense to regulation, rather than a claim of wrongdoing and harm that rivals litigate. FOIA's exemption in effect creates an exemption based on a one-sided claim, which is well

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mandate is Mark Q. Connelly, *Secrets and Smokescreens: A Legal and Economic Analysis of Government Disclosures of Business Data*, 1981 WIS. L. REV. 207 (1981).

116. It may be cheaper for a firm to create the trappings of trade secrecy to impress an agency reviewer than to risk toxicity studies. However, the agency staff may become skilled at detecting invalid claims.

suited to camouflage.

The agency is the broker for the public, with a strong statutory directive to disclose; however, it also has the option of withholding. In addition to the agency's status as an outsider to the regulated industry, several other factors compromise administrative management of trade secret exemptions. The legal decision maker who is called upon to evaluate a secret is in a difficult position because it is hard for someone outside an industry to gauge the effects of releasing the information. The structure of the situation lends rhetorical power, a kind of "Pandora's Box" effect, to claims of entitlements to secrecy.[117]

In addition, the use of property rhetoric increases the pressure on agencies to accommodate secrecy claims. Usually, the information in question came from a firm, and is therefore thought of as "the firm's data." The agency will have been assured by the information "owner" that release will harm the firm.[118] The entitlement of those seeking it from the agency is less concrete. Agency personnel may be daunted by the prospect of a Constitutional takings dispute,[119] or by the possibility of prosecution under the Trade Secrets Act or Economic Espionage Act.[120] Finally, the costs of checking overbroad claims are substantial, even if agencies have direct access to data for fact checking.[121]

2. Confidential Business Information

The statutory language defining CBI is broad: "commercial or financial information obtained from a person and privileged or confidential."[122] Most courts have read this second prong of FOIA's Exemption 4 as separate and additional to the basic trade secret exemption. The term is used to describe information claimed to be confidential by its submitter, but not meeting the legal test for trade secrecy.

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117. *See* Mary L. Lyndon, *supra* note 1, at 2, 35, 49, 55 (drawing on the work of SISELLA BOK, SECRETS—ON THE ETHICS OF CONCEALMENT AND REVELATION (1983) to discuss the ways secrecy affects disclosure and research incentives in the EHS context).

118. WRIGHT & GRAHAM, *supra* note 1, at § 5645 (discussing the difficulties of choosing terminology when the legal meanings for "possessor" of information, "holder" of a privilege, and "owner" of conflict fully or partially overlap).

119. *See* discussion *supra* Part II.B.

120. *See infra* Part II.C.3.

121. *See infra* Part III.B.

122. 5 U.S.C. § 552(b)(4).

The first requirement for CBI is that the information be "commercial."[123] There has been some debate over whether "commercial" means any information that may affect a financial interest,[124] or whether it must be information about the workings of a commercial business, the release of which would affect its competitive status.[125] A wide range of documents have been construed as "commercial or financial" for purposes of this exemption.[126]

The requirement that non-trade secret information be "privileged or confidential" has produced two different court tests for Exemption 4 coverage. Both are substantial departures from conventional legal notions of confidentiality and trade secrecy.

In the 1974 decision of *National Parks Conservation Association v. Morton*,[127] the United States Court of Appeals for the D. C. Circuit held that the test for confidentiality is an "objective" one, and requires a showing that disclosure would cause substantial competitive harm to the person from whom the

123. *See* Nat'l Ass'n of Homebuilders v. Norton, 309 F.3d 26, 38 (D.C. Cir. 2002) (data pertaining to location of endangered species was not "commercial or financial information" by virtue of the agency's receipt of the data pursuant to a *quid pro quo* between governmental agencies).

124. *See, e.g.*, Flathead Joint Bd. of Control v. U.S. Dep't. of Interior, 309 F. Supp. 2d 1217, 1221 (D. Mont. 2004) (state irrigation district negotiating water rights with tribe sought records found exempt as CBI, since water rights are an object of commerce; information describing water resources affects negotiations and therefore is "commercial information in function"); *see also* Starkey v. U.S. Dep't. of Interior, 238 F. Supp. 2d 1188, 1195 (S.D. Cal. 2002) (owner of easement over land sought well and water related information that was found to be commercial or financial in nature, because water is a scarce resource and disclosure would affect negotiations or litigation about water rights).

125. In *N.Y. Pub. Interest Research Group v. U.S. Envtl. Protection Agency*, 249 F. Supp. 2d 327, 332–34 (S.D.N.Y. 2003), the court held that documents which General Electric submitted to the EPA were not records of "intrinsic commercial value." Instead, the court found that analyses of costs, benefits, and environmental impacts of EPA's proposed remedy and of the company's alternative plan for removing PCBs from the Hudson River did not reveal anything commercially sensitive about the internal workings of GE, but were public information. *Id.*

126. *See Starkey*, 238 F. Supp. 2d at 1188 (well and water information that would affect negotiations or litigation over water rights); Citizens Com'n on Human Rights v. Food and Drug Admin., 45 F. 3d 1325 (9th Cir. 1995) (drug safety and efficacy test data and unapproved supplemental use data); Critical Mass Energy Project v. Nuclear Regulatory Commission, 830 F.2d 278 (D.C. Cir. 1987) (reports on safety and reliability of nuclear power plants prepared by industry consortium); American Airlines v. National Mediation Board, 588 F. 2d 863 (2nd Cir. 1978) (list of labor union members' card numbers and identifying information).

127. 498 F.2d 765, 766, 770 (D.C. Cir. 1974).

government obtained the information.[128] The court rejected a reading based on whether the information would customarily be disclosed to the public, since, as the court pointed out, in the FOIA context, access should not depend on the judgment of the firm that originally submitted the documents to the government.[129] The court's reasoning on this point is consistent with FOIA's purpose: to mandate access in the face of the strong market pressures to claim confidentiality.

However, the *National Parks* court also held that information may be "confidential" if disclosure is likely to impair the government agency's ability to obtain necessary information in the future. This test expands Exemption 4 beyond its stated concern for commercial interests. The court's ruling grants the government the prerogative to decide whether information should be "confidential" based on its own regulatory agenda. The decision implicitly acknowledges the strength of industry resistance to full disclosure and tries to put agencies in a better position to negotiate disclosure to the government, by allowing agencies to guarantee continued confidentiality *vis-a-vis* the public. There are two basic problems with this approach. First, FOIA is designed to make documents available to the public, not just to the agency. Second, it seems clear now that the ruling has not actually encouraged disclosure.[130]

After *National Parks,* Exemption 4 was further expanded. First, the First Circuit provided a minor expansion in 1983, holding that the *National Parks* test was not the exclusive CBI

128. *See id.*; *Critical Mass Energy Project v. Nuclear Regulatory Commission,* 931 F.2d 939 (D.C. Cir. 1991) (nuclear industry groups' safety reports voluntarily provided to the agency are confidential and exempt from disclosure), *vacated and reh'g en banc granted,* 942 F.2d 799 (D.C. Cir. 1991), *and grant of summary judgment to agency aff'd,* 975 F.2d 871, 880 (D.C. Cir. 1992) (*en banc*) (confining the reach of *National Parks* to information that is furnished to the government under legal obligation). Under the *Critical Mass* rule, there are four parts in the "confidentiality" definition: courts first consider whether the original document submission was "voluntary" and, if it was, whether the document would "customarily be disclosed to the public." If it was not, the court applies *National Parks* by considering whether the government's future access will be impaired by disclosure or competitive harm will result from disclosure.

129. *National Parks,* 498 F.2d at 766–67.

130. As Wagner documents in *Common Ignorance, supra* note 1, at 1728–30, information gaps and the administrative costs of managing an inadequate reporting system continue to grow, as market actors have numerous reasons for not divulging information that does not cast them in a positive light. *See* discussion *infra* Part IV.B.

test.[131] Then, almost a decade later in *Critical Mass Energy Project v. Nuclear Regulatory Commission*, the D.C. Circuit held that information that is voluntarily submitted to the government is categorically protected, provided that it is not customarily disclosed to the public by the submitter.[132] *Critical Mass* thus abandoned the *National Parks'* concern about who would determine which documents are exempt; the court left the choice in the hands of the document submitter. Given the current trend toward broad reliance on secrecy in business practice, *Critical Mass* does not provide a good access rule.

While *Critical Mass* has not been widely adopted in other circuits,[133] its holding has been influential.[134] Agency regulations concerned with managing documents gathered during routine administration of EHS laws largely follow *Critical Mass* and reflect considerable solicitude for industry prefer-

131. In *9 to 5 Org. for Women Office Workers v. Bd. of Governors of Fed. Reserve System*, 721 F.2d 1, 8 (1st Cir. 1983), the First Circuit held that *National Parks'* two-part test was not the exclusive test for CBI exemption. Rather, that court said if the government could show that a specific public or private interest would be harmed by disclosure, the agency could invoke Exemption 4, even if its reasons did not fit the *National Parks* test. *Id.*

132. 975 F.2d at 880 (confining the reach of *National Parks* to information obligatorily provided to the government).

133. *See* N.Y. Pub. Interest Research Group v. U.S. Envtl. Prot. Agency, 249 F. Supp. 2d 327, 335 (S.D.N.Y. 2003) (noting that the Second Circuit had not commented on *Critical Mass* and that no other circuit had expressly adopted it); Dow Jones Co., Inc. v. F.E.R.C., 219 F.R.D. 167, 178 (C.D. Cal. 2003) (remarking that the *Critical Mass* test has not been adopted by any other circuit and "is not consistent with Ninth Circuit jurisprudence"); Comdisco, Inc. v. General Services Admin., 864 F. Supp. 510, 517 (E.D. Va. 1994) (remarking that "it is doubtful" that the Fourth Circuit would adopt *Critical Mass*). *But see* Envtl. Tech., Inc. v. U.S. Envtl. Protection Agency, 822 F. Supp. 1226, 1229 (E.D. Va. 1993) (releasing information concerning environmental cleanup services and equipment, following *Critical Mass* test). *But see* Comdisco, Inc., 864 F. Supp. at 517 n.8 (disparaging *Envtl. Tech., Inc.*).

134. *See* Defenders of Wildlife v. U.S. Dep't of Interior, 314 F. Supp. 2d 1, 16 (D.D.C. 2004) (draft severance agreements between deputy secretary and former employers were not customarily disclosed and so were exempt under FOIA); Nw. Coal. for Alternatives to Pesticides v. Browner, 941 F. Supp. 197 (D.D.C. 1996) (EPA does not have to release identifying Chemical Abstract System numbers of pesticide ingredients as disclosure would cause competitive harm); County of San Diego v. Babbitt, 847 F. Supp. 768, 773 (S.D. Cal. 1994) (financial information not relevant to NEPA compliance but affecting water rights negotiations was exempt as confidential); Landfair v. U.S. Dep't of the Army, 645 F. Supp. 325, 327–28 (D.D.C. 1986) (voluntarily submitted documents, covered by agreement of confidentiality reached with agency at time of submission and having commercial value, were exempt from disclosure). *See also* Wagner, *supra* note 1, at 1702, 1728–30.

ences.[135] The Critical Infrastructure Information Act, which significantly restricts access to data,[136] adopts an approach which is consistent with the *Critical Mass* decision.

The CBI category seems to be expanding. Given the market's strong incentives to hide information, this should be a real concern. Reichman's historical perspective on the value of data in the transition from an industrial to an information economy helps explain this expansion.[137] Also, as Steven Wilf points out, assets of all kinds can be treated as valuable for purposes of stock market presentation.[138] As Part II.B discusses, information valuation is inexact and open-ended: at any point in time it may be plausible that information will be valuable later. Indeed, it seems that CBI may swallow the law's underlying disclosure mandates.

Current disclosure arrangements operate on the premise that controlling access to data will protect significant commercial value while allowing access to the limited number of individuals that need that data for risk management. However, it appears that the incentives to claim CBI and the ease of doing so are feeding the expansion of the exemption. In any case,

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135. Agency processes now offer expansive protections to document submitters. The EPA's public information rules cover nearly fifty pages at 40 C.F.R. Part 2, which can be accessed through the agency's web site. *See Public Information Regulations*, EPA, Feb. 21, 2006, *available at* http://www.epa.gov/foia/foiaregs.htm. EPA's basic information provisions are contained in Subpart A, "Procedures for Disclosure of Records Under the Freedom of Information Act," and Subpart B, "Confidential Business Information." *Id.* The Subpart A rules outline the processes for making a FOIA request form EPA, that is, they explain where requests for records are to be filed, the basic procedures for making requests, exemptions, and EPA's approaches to preservation of records.

136. Pub. L. No. 107-296, 116 Stat. 2135 (2002) (codified at 6 U.S.C. §131 (2002)). The Homeland Security Act of 2002 includes the Critical Infrastructure Information Act (CIIA) of 2002, which significantly restricts the availability of information under FOIA. Persons voluntarily submitting information to the government for purposes of homeland security may include with the submission an express statement that the information is voluntarily submitted, pursuant to the CIIA. The information will then be exempt from FOIA's disclosure requirements. *See* Gina Marie Stevens, *Homeland Security Act of 2002: Critical Infrastructure Information Act*, Congressional Research Service, Order Code RL31762 (Feb. 28, 2003). *See also* Rena Steinzor, *"Democracies Die Behind Closed Doors": The Homeland Security Act and Corporate Accountability*, 12 KAN. J.L. & PUB. POL'Y 641 (2003); Kristen Elizabeth Uhl, *The Freedom of Information Act Post 9/11: Balancing the Public's Right to Know, Critical Infrastructure Protection, and Homeland Security*, 53 AM. U. L. REV. 261 (2003).

137. *See* Reichman, *supra* note 24.

138. *See* Wilf, *supra* note 87, at 3–5 (describing trade secrets as "self-help" intellectual property).

agencies are left with daunting information dilemmas.[139]

3. Criminal Sanctions for Disclosure

Some federal and state statutes impose criminal penalties for misappropriation of trade secrets. For instance, the 1996 Economic Espionage Act (EEA) expanded on the 1918 Trade Secrets Act (TSA),[140] which also remains a part of the landscape.[141]

In *Chrysler Corporation v. Brown*, the Supreme Court addressed the relationship between the FOIA, the TSA, and provisions regarding disclosure that are contained in specific regulatory statutes.[142] The Court held that FOIA exemptions are not mandatory and agencies have discretion to release information covered by the exemptions. The controlling law for purposes of disclosure is the congressional authorization for agency regulations and practices. Where Congress has given an agency explicit authority to release particular kinds of information that would otherwise be subject to a trade secrecy claim,[143] or where Congress has given the agency general rule making authority, the agency may disclose information claimed

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139. In *Seeking Truth for Power: Informational Strategy and Regulatory Policymaking*, 89 MINN. L. REV. 277 (2004), Cary Coglianese, Richard Zeckhauser, and Edward Parsons propose ways for agencies to handle regulated firms' resistance to disclosure of useful information of all kinds. These include offering incentives to firms that disclose, handling regulated groups by playing off differences among individual firms' interests, and generally incorporating greater recognition of information incentives into regulation. The article offers substantial and useful recommendations to address the problem. At the same time, their proposals do not seem up to the job of reversing the basic incentives against cooperating with regulators or correcting the current administrative dysfunctions at agencies like the EPA, as Professor Wendy Wagner describes them. Wagner, *supra* note 1. Wagner describes an agency stymied by the perverse information rules that it must implement and overcome.

140. 18 U.S.C.A. § 1905 (2006); O'REILLY, *supra* note 109 (describing the specific criminal prohibition that applies to the FDA's distribution of trade secret information).

141. Rochelle Cooper Dreyfuss, *Trade Secrets: How Well Should We Be Allowed to Hide Them? The Economic Espionage Act of 1996*, 9 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 1 (1998); Geraldine Scott Moohr, *The Problematic Role of Criminal Law in Regulating Use of Information: The Case of the Economic Espionage Act*, 80 N.C. L. REV. 853 (2002).

142. 441 U.S. 281 (1979).

143. *See* Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. § 136h(d)(1) (2006); Toxic Substances Control Act, 15 U.S.C. § 2613(b) (2006); Emergency Planning and Community Right-To-Know Act of 1986, 42 U.S.C.A. § 11042 (2006).

to be protected by the Trade Secrets Act.[144]

Neither the EEA nor the TSA change the underlying law of trade secrecy, nor do they purport to criminalize the release of health and environmental or safety data. The foundational concept—trade secrets—does not include such data and incremental expansions of FOIA's Exemption 4 do not change this. Health, safety, and environmental data are not in the same legal category as purely commercial information. However, the EEA and TSA compound the ambiguities of disclosure in administrative settings. Worse, the statutes add an in terrorem effect to existing provisions. The very existence of these statutes increases the pressure on agency employees to withhold contested information, even where they actually have the authority to disclose.

In summary, while disclosure is mandated as a general matter, nondisclosure privileges have grown. Case-by-case consideration of claims of entitlement tends to favor the commercial interest. Firms may credibly argue that the interest in disclosure is uncertain or speculative and should give way to the more tangible commercial interest, even though EHS and FOIA laws were enacted to address this very difficulty. If agency staff is also concerned about takings arguments and possible criminal prosecutions, disclosure will be more limited.

III. INFORMATION DYNAMICS IN RISK MANAGEMENT AND IN BUSINESS

This section examines the practical implications of access and nondisclosure privileges to see if there are greater economic and social benefits on one side or the other. It sketches the outlines of the development and use of information in EHS risk management and then describes the dynamics affecting business management of the same information.

The two uses of EHS information are very different. The scientific, medical, and market applications of risk information are widespread, increase in value over time, and have dramatic network characteristics. The individuals and institutions that

144. This requires more than simple authority to make housekeeping rules. *See* Elinor P. Schroeder & Sidney A. Shapiro, *Responses to Occupational Disease: The Role of Markets, Regulation, and Information*, 72 GEO. L.J. 1231, 1282–88 (1983) (discussing the authority of the Occupational Health and Safety Administration to release trade secrets under its general rule making authority).

require this information are scattered and diverse and must respond to continual changes in the market and in the risk environment. Thus, there are tremendous barriers to research, analysis, and distribution of knowledge about EHS concerns. Yet, the cumulative social value of EHS information is great. In contrast, commercial interests in data are more focused and more organized; also, these interests often are limited in duration. As a general pattern, it appears that secrecy's opportunity costs are likely to be greater on the risk management side than are its benefits on the commercial side.

A. Health and Environmental Information

Participants in the market and in civil society need to monitor and select among EHS risks.[145] Individuals, groups, and institutions participate at many levels in producing and assembling EHS knowledge, and they use that information in economic, cultural, and political processes. Health, safety, and environmental data describe a great range of phenomena and activities. Individuals must make informed decisions, such as which pharmaceuticals to rely upon, or where to work and buy a home, as well as what foods to consume. Social groups and institutions also need to understand risks to make decisions, such as what kinds of regulation to support or what products to produce. These choices are affected by risk considerations.[146] To the extent that data is withheld from social processes of risk

145. *See* Robert W. Collin & Robin Morris Collin, *The Role of Communities in Environmental Decisions: Communities Speaking for Themselves*, 13 J. ENVTL. L. & LITIG. 37 (1998); Janice Gorin, *Caught Between Action and Inaction: Public Participation Rights in Voluntary Approaches to Environmental Policy*, 24 STAN. ENVTL. L.J. 151 (2005); Frances Irwin & Carl Bruch, Information, Public Participation, and Justice, 32 ENVTL. L. REP. 10784 (2002); Gregory N. Mandel, *Technology Wars: The Failure of Democratic Discourse*, 11 MICH. TELECOMM. & TECH. L. REV. 117 (2005); Jim Rossi, *Participation Run Amok: The Costs of Mass Participation for Deliberative Agency Decisionmaking*, 92 NW. U. L. REV. 173 (1997); Stephanie Tai, *Three Asymmetries of Informed Environmental Decision Making*, 78 TEMP. L. REV. 659 (2005). *See also* DOROTHY NELKIN, *Science Controversies: The Dynamics of Public Disputes in the United States*, *in* HANDBOOK OF SCIENCE AND TECHNOLOGY STUDIES 445 (Shiela Jasanoff et al. eds., 1995). Ecological economists are restating the policy issues to include the role of local and public participation, making use of their particular expertise and incentives. *See, e.g.*, Robert Costanza et al., *Principles for Sustainable Governance of the Oceans*, 281 SCIENCE 198, 198–99 (1998).

146. Sandra S. Batie & David E. Ervin, *Transgenic Crops and the Environment: Missing Markets and Public Roles*, 6 ENV'T & DEV. ECON. 435 (2001); Lyndon, *supra* note 5, at 1831–32 (discussing comparison shoppers).

assessment, it undermines personal autonomy, participation, and efficiency across the society.[147] The significance of broad access to EHS data becomes apparent when the unique characteristics and social functions of EHS information are understood.

1. The Content and Form of EHS Information Is Highly Diverse

The content of EHS data is remarkably diverse. The information needed to understand a risk may include basic data on the nature of exposure, such as chemical identity, dose, timing, and the route of exposure; the environmental fate of substances in the air, water, soil, and organisms; the identity of the natural and technological mechanisms that are the sources of the exposure; and the symptoms or responses in people, animals, plants, soil, and water.[148]

Useful EHS knowledge takes a wide variety of forms. It emerges from processes that include informal recognition of exposures and damage, formal disclosure, collection and assembly of data, expert interpretation, and scientific research.

Relatively simple data describing the presence and movement of environmental or product materials provide the basis for understanding exposures that affect human health and identify the ecological footprints of economic activity.[149] Some-

147. *See supra* note 5 and accompanying text.

148. Physical phenomena are inherently dynamic. Professor Terry Collins explains:

> Imagine all of Earth's chemistry as a mail sorter's wall of letter slots in a post office, with the network of compartments extending toward infinity . . . . Each compartment represents a separate chemistry so that, for example, thousands of compartments are associated with stratospheric chemistry or with a human cell. An environmentally mobile persistent pollutant can move from compartment to compartment, sampling a large number and finding those compartments that it can perturb. Many perturbations may be inconsequential, but others can cause unforeseen catastrophes, such as the ozone hole or some of the manifestations of endocrine disruption.

Terry Collins, *Toward Sustainable Chemistry*, 291 SCIENCE 48 (2001).

Alternate taxonomies of EHS information are possible and in use in different settings. Daniel C. Esty, *Environmental Protection in the Information Age*, 79 N.Y.U. L. REV. 115 (2004) (articulating a taxonomy of the information needs in many environmental management problems).

149. Methodologies and processes for gathering basic EHS data are developing. For instance, ecological footprint data is reported by many companies through the

times exposure and environmental footprint descriptions facilitate choices without complex research. Secrecy interferes with this elementary efficiency. At a minimum, disclosure of the physical facts of EHS exposures and footprints should be required.

2. EHS Information Is Widely Distributed Spatially

Both EHS data sources and the demand for this information are widely distributed geographically and in social institutions. Lay people, professionals, and scientific experts in many fields contribute to EHS learning, use risk information, and provide feedback for its further development. To identify and assemble this information requires coordination among those who create the risks, those who bear them, and the community of experts interested in and available to research the implications of the data. These processes require participation, investment, and time.

The local and non-expert uses of EHS information are an important dimension of risk management.[150] The process of collecting data and making it into information is both individual and social. While elementary data can be developed into more complex information and knowledge, expert interpretation and further research are not always necessary.[151] Indi-

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Global Reporting Initiative, whose web site is: http://www.globalreporting.org. *See* Cynthia A. Williams, *A Tale of Two Trajectories*, 75 FORDHAM L. REV. 1629, 1640 (2006) (discussing the GRI as a project originally developed jointly between the United Nations Environment Programme and the Coalition for Environmentally Responsible Economies, or CERES, and also noting that the project is becoming a widely adopted framework for reporting on the economic, environmental, and social effects of company action); Case, *supra* note 23 (describing development of corporate reporting in the EHS setting).

Mass balance accounting identifies the flow of materials through the economy and its constituent activities. *See* Robert J. Klee, *Enabling Environmental Sustainability in the United States: The Case for a Comprehensive Material Flow Inventory*, 23 STAN. ENVTL. L.J. 131 (2004). In addition to the technical challenges of describing EHS effects, the significance of "harm" is also dynamic and complex. *See* Albert C. Lin, *The Unifying Role of Harm in Environmental Law*, 2006 WIS. L. REV. 897 (2006) (exploring "harm" as a normative concept in environmental and related areas of law).

150. *See* Lyndon, *supra* note 20, at 157–59 (discussing the choice of legal instruments based upon information problems and institutional capacity to gather and assess information); Steven Shavell, *Liability for Harm Versus Regulation of Safety*, 13 J. LEGAL STUD. 357, 359–60 (1984).

151. Shavell has noted that much regulation can be justified by common knowledge or non-expert information. *Id.* Different regulatory decisions require

viduals may notice a particular local exposure or effect and act on it, as when consumers change products or locations. They can also share local information informally or contribute it to a formal assembly process, whether lay or expert. Facilities for collecting and sharing EHS data are expanding.

Scientific research may be necessary to understand the import of data. However, it is not useful to think of "science" or "scientists" as a homogenous category. Researchers are often separate and, to varying extents, in competition with each other. Science is a genre of knowledge production that is carried on in a variety of institutions, including companies, governments, universities, and assorted partnerships of these three. The fruits of scientific research have economic value and may contribute to or compete with existing knowledge resources.[152] Even when there is little competition, many EHS problems are interdisciplinary. Although ecology, toxicology, and other research fields work across conventional disciplines and despite the capacity for networking, scientists interested in related problems are dispersed.

3. EHS Information Is Developed Over Time

Risk management is an iterative process. Gathering, synthesizing, and distributing data can be simple, or it can be enormously complex, especially when the data is very costly to collect and interpret. The regulatory system has acted as a clearinghouse in gathering and interpreting EHS information, and as a guide in setting the research agenda and synthesizing information.[153] This effort has brought understanding that al-

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different levels of information. It is inefficient to standardize risk assessment so as to require the same specifics for all decisions. *See* Bernard D. Goldstein, *Risk Assessment and the Interface Between Science and Law*, 14 COLUM. J. ENVTL. L. 343 (1989); Lyndon, *supra* note 20. *See also* Adam M. Finkel, *Is Risk Assessment Really Too Conservative?: Revising the Revisionists*, 14 COLUM. J. ENVTL. L. 427, 430–31 (1989) (discussing factors which make each risk assessment unique and disadvantages of standardizing QRA components).

152. Sheila Jasanoff discusses the implications of the increasing "embeddedness" of science in society: "The growth of national economies, the comparative military advantages of states, the market shares of companies, the health and safety of populations and the environment, and, increasingly, the vitality of universities and the personal fortunes of scientists all depend on producing useful scientific knowledge." Jasanoff, supra note 31, at 23. In this setting, knowledge is produced by companies for its market value and by scientists for research prestige. *See id.*

153. *See, e.g.*, Rebecca S. Eisenberg, *Patents, Product Exclusivity, and Informa-*

lows us to remedy current problems and prevent future ones, rather that repeating them.

Knowledge itself evolves over time. Health and environmental understanding is usually developed late, after exposure or environmental impact, and perhaps long after EHS effects have appeared. Also, data accumulate and information constantly changes as the physical world develops and as new knowledge emerges or becomes outdated. Therefore, regulation cannot be based upon one snapshot but needs a steady stream of information. We cannot be satisfied to take a quick look at EHS data and then forget about it.

When risks are not identified early, they may grow, and sometimes uncertainty and confusion about their characteristics will also grow with time. With latent harms, apparently low-level risks, or synergies that are not recognized, delay often compounds the information problem even as the scale of society's investment in the cause of the problem increases. In each consecutive period, decisions may be made on the basis of ignorance about risks. Early inclinations to dismiss or discount a problem may become embedded in investments and infrastructure.[154] Recognition and acknowledgment thus may become more costly over time.

4. Legal Mandates Shape EHS Information

At each stage of EHS learning and risk management, information production has been influenced by social decisions. The law's selection of goals, standards, and benchmarks has shaped current EHS knowledge.[155] Much of the research of the past three decades has been dictated by Congressional and

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tion Dissemination: How Law Directs Biopharmaceutical Research and Development, 72 FORDHAM L. REV. 477 (2003); NATIONAL RESEARCH COUNCIL, COMMITTEE ON GEOPHYSICAL AND ENVIRONMENTAL DATA, BOARD ON EARTH SCIENCES AND RESOURCES, RESOLVING CONFLICTS ARISING FROM THE PRIVATIZATION OF ENVIRONMENTAL DATA, §§ 11 et. seq. (2003) (modeling environmental information functions on tree's roots, trunk and branches).

154. Investments in technology are costly to reduce. *See* Lyndon, *supra* note 20 (discussing the importance of initial selection of technologies in light of path dependence). James Robert Brown, *Privatizing the University—The New Tragedy of the Commons*, 290 SCIENCE 1701, 1701–02 (2000) (privatization of research means that one point of view will tend to prevail); Michael A. Ven Lenete, *Building the New World of Nanotechnology*, 38 CASE W. RES. J. INT'L L. 173, 178–81 (2006) (describing government actions to stimulate nanotechnology research).

155. *See* discussion *supra* notes 19–22, 32–37.

regulatory strategies and by the response of the courts to emerging risk management issues. Some of these strategies may be outdated. Among the lessons of three decades of EHS regulation, one may be that nondisclosure privileges are obsolete.

EHS regulation addresses difficult questions, such as decision making under conditions of uncertainty, the choice among available regulatory strategies, and allocation of the burdens of moving to more sustainable technologies. The option of invoking an entitlement to secrecy, even based upon intellectual property principles, compromises risk monitoring and management.

We have invested in EHS knowledge at considerable cost, and now we are in a much improved position to understand and evaluate new technologies.[156] Building the institutions that identify, distribute, and use this data—the "social learning" process—has been a major task of health and safety regulation. Risk management requires continual investments in learning, but this is a necessary dimension of the technologies we use. However, it need not be so costly. Information can be used more effectively if it is shared.

B. Risk Data in Commercial Rivalry

Both collaboration and secrecy are central themes in business.[157] To use and profit from information, one must share it. At the same time, each firm is in competition with its nearest rivals and seeks to maximize its edge over them. These two factors shape commercial incentives with respect to information.

This section looks at four aspects of data control in the commercial setting. First, it observes that competitive uses of data tend to be more concentrated in space and time than is

156. E.g., genetically modified organisms (GMO) in agriculture. *See* Geoffrey Lean, *Judges Order Disclosure of Secret Study on GM Risks*, INDEPENDENT, June 12, 2005, *available at* ProQuest, Doc. No. 852718171 (German court orders Monsanto to release 1139-page study on health effects on rats of genetically modified corn); Jeffery M. Smith, *Cause for Concern*, THE ECOLOGIST, Oct. 1, 2005, at 26 (European Commission's decision to clear Monsanto GM corn for use in EU is premature as company's research data is troubling and needs further analysis).

157. *See, e.g.*, Peter Stevens, *To Hold or to Share? The Control of Intellectual Property in Standards Development*, ISO BULLETIN, Jan. 2003, at 24–26 (as an industry matures, the need for standards will develop, and firms share information to develop them).

risk management; also, data exchange actually occurs regularly within rivalries. These patterns may present opportunities to adjust current disclosure rules in order to allow greater access to EHS data while still supporting commercial interests in the information. Second, there are significant costs to maintaining information in order to keep it useful, rather than stale or buried and forgotten. Legal rules that allocate the burden of production and maintenance to the public or to researchers can effectively deny access. Third, the asymmetry between the immediate bases of a proprietary claim and the more holistic and apparently uncertain value of disclosure tends to create the impression, especially in the business community, that it is unnecessary and even wasteful to disclose. Finally, information rules that privilege confidentiality invite strategic behavior where there are reasons to avoid scrutiny. Once begun, secrecy will tend to persist and even expand. Thus, claims of entitlement to "competitive information" are likely to be overbroad in the EHS setting.

1. The Commercial Value of Secrecy Is Specific to Its Commercial Setting

When commercial data is considered from a particular firm's perspective, its value may appear to be very great—the firm's success may seem to depend upon it. Also, its value to the firm may seem to extend far into the future, or at least it is plausible to believe that the information may be useful in ways that cannot be anticipated. Yet, from the perspective of the risk management imperatives outlined in the previous section, commercial interests in EHS data often are relatively confined and temporary.

Firms' choices respond to the particular dynamics in the local rivalry, the unfolding patterns in the subject matter of the business, and the ways individual firms play the game. Firms are mainly concerned with competition with their rivals—a limited group. "Competitive" information is information that may affect a firm's position in this rivalry. Any particular piece of information matters to a loosely knit group of firms working in the same vicinity of the research "topography." Rivals are in touch with each other through formal and informal channels.[158]

158. Each rival has incentives to control access to any information in order to

They form clusters, actively observing each other and exchanging data and employees, while trying to gain an edge on each other. In any one case, the range of competitive threats is identifiable; specific rivals usually are known, though their individual agents may not always be identified. The uses that opponents might make of the information also are basically known and can be anticipated and obsevered.

Business confidentiality concerns are "local," then, in the sense that firms' information interests are near each other in the "knowledge topography." To call the commercial interest local and temporary is not to question its validity. However, the homogenous and compact distribution of the information in the business setting contrasts sharply with risk management dynamics.

Commercial rivalries spawn "clandestine" markets in information. In the real world much "secret" information actually may be readily available to firms within the same cluster of rivals. In fact, industrial espionage is widespread, and the "security" services associated with it compose a substantial industry. Edmund Kitch has remarked 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.[159] This suggests that the management of pri-

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maximize its edge. *See* Jennifer F. Reinganum, *The Timing of Innovation: Research, Development and Diffusion, in* HANDBOOK OF INDUSTRIAL ORGANIZATION 904 (1988). 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.*

159. The trade press is full of information about new processes. Firms regularly hire consultants, looking particularly for experienced consultants who have worked with competitors. Perhaps technical information is not as vulnerable to theft or loss as it first appears. Kitch explains this openness 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. *See* Kitch, *Rights in Valuable Information, supra* note 59, at 711–15. 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, who says, "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 also* RUSSELL B. STEVENSON, JR., CORPORATIONS AND INFORMATION—SECRECY, ACCESS AND DISCLOSURE 7–9 (1980).

vate access to information is institutionalized to a certain extent within rivalries. EHS risk information may be changing hands among firms that present a united front to regulators.

Not all information that could be valuable in fact has value. Depending on the particular business setting and the actual context of the rivalry taking place, information may be competitively valuable or not, and this may vary at different times. In any individual case, particular information may not be competitively valuable, even though it is in a category that may be valuable in other circumstances. Within a category that is valuable, some data may relate to health and environmental risks.[160] The two types of information—commercial and EHS—overlap, but only to a limited degree.

Commercial interests in data also have a temporal dimension. Competition over any particular information may be of limited duration.[161] To the extent that a product or process is replaced over time or becomes known in the industry, the competitive sensitivity of the data will lessen. Also, over time new information of value is likely to become at least partially visible to the other players. This effect is not only natural but intended by intellectual property law, as trade secrecy is leaky and copyright and patent have time limits to allow information to pass into the public domain.

Identifying more precisely the range of parties interested in the information and its time frame may provide a basis for different types of legal protection for its commercial value. The limited range of commercial interests in secrecy also suggests that the cost-benefit balance will often weigh against secrecy in individual cases, especially if other protections for investments can be devised.[162]

2. The Costs of Managing Complex Information

160. For instance, the volume of a firm's discharge of a chemical may be only marginally useful to commercial competitors assessing a firm's products, processes, or business plans, but crucial to identifying human exposures and effects or understanding the firm's ecological footprint.

161. Levin's study addressed the appropriate time span for legal protection. Appropriability declines as diffusion takes place and varies by industry, technology, and market demand. In Levin's survey, a five year useful life was a common estimate for trade secrets and patents. The actual time for duplication of a major innovation or a typical patented innovation was usually one to three years. A typical unpatented innovation may be duplicated within six to twelve months. *See* Lyndon, *supra* note 1, at 18.

162. *See infra* Part IV.

Encourage Overbroad Confidentiality Claims

In his original market failure analysis of patent law, Kenneth Arrow characterized information as easy or costless to transfer.[163] Of course, this is true of much information, but information costs can take many forms.[164] Complex data may need to be identified, sorted, assembled, communicated, updated, interpreted, and often developed with expert assistance. Each of these processes carries its own costs and difficulties, which vary by context. It may be costly to determine the precise content, uses, and duration of either the HIS risk implication or the competitive value of information. Firms may have difficulty identifying their own true confidentiality needs, so it may make "business sense" to claim expansively. If they must guess, they are likely to conclude that a wide range of information could be useful to others. Much information that has no immediate value also may be kept secret as a matter of good housekeeping, since later it could turn out to be valuable to one's own firm or to rivals. Professor Rebecca Eisenberg has examined the information culture of the biotech industry and found that firms "care for" information that really matters to them; they store information that does not or use standard contracts to place on other parties the burden of managing less useful information.[165]

Litigators work within this dynamic; voluminous discovery requests and responses make it costly to find useful information. A similar difficulty plagues the whole subject of disclosure and confidentiality, as agencies are not equipped to manage archives and can become overwhelmed with "paper."[166] Under current rules, which increasingly give discretion to firms that submit information to agencies, the costs of simply claiming information as "competitive" and "proprietary" are relatively low, while the costs of sorting through data and identifying what is commercially valuable may be high and are likely to be greater than the cost of making a confidentiality claim.

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163. *See* ARROW, *supra* note 53, at 614–15.

164. *See, e.g.*, Kitch, *Rights in Valuable Information*, *supra* note 59, at 711–15.

165. Eisenberg, *supra* note 153, at 478–81 (discussing information cultures in biotech industry; firms "care for" information that really matters to them; they store information that does not or use standard contracts they insist upon).

166. Wagner, *supra* note 1, at 1689 n.48; Lavelle, *supra* note 10.

3. Firms Perceive Disclosure as Unjustified

The only type of information that firms generally want to distribute is advertising or its equivalent, positive descriptions of their activities.[167] Involvement in the commercial race leads firms to resist disclosing anything that might be useful to rivals, except when disclosure is well supervised or is done for a specific return, as when firms are working together or are hiring employees away from each other.[168] Having to disclose information that is seen to relate to internal business matters reduces the firm's sense of control over its position in the rivalry game. From a business perspective, disclosure may seem both intrusive and wasteful.

Since health and environmental concerns often are not immediately felt, they are easy to underestimate, dismiss, or ignore. Firms are prone to seeing health and environmental law as "outside" interference. From this vantage point, the costs of reporting, the costs of considering and implementing changes in the business to accommodate risk management concerns, and the costs of rebutting critiques and managing public perceptions may reinforce the immediate and local focus.[169]

Secrecy itself creates ambiguity that may inhibit rational action.[170] The prospect of disclosure or even of any scrutiny may appear threatening because of the possibility of losing too much control, exposing a weak link that could cause a firm's complex interlocking assets to unravel.[171] Within a firm, un-

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167. Voluntary corporate disclosure is the subject of a growing literature that examines the circumstances in which disclosure will occur. For discussion of disappointing corporate performance of environmental reporting to the Securities and Exchange Commission, see Terra Pfund, *Corporate Environmental Accountability: Expanding SEC Disclosures to Promote Market—Based Environmentalism*, 11 MO. ENVTL. L. & POL'Y REV. 118 (2004).

168. Since EHS disclosure requests are communications from a different social milieu, they may also be ambiguous, at least in their local implications. *See* Timothy F. Malloy, *Disclosure Stories*, 32 FLA. ST. U. L. REV. 617, 639–42 (2005).

169. Amitai Aviram & Avishalom Tor, *Overcoming Impedimenta to Information Sharing*, 55 ALA. L. REV. 231 (2004) (describing factors causing sub-optimal private information sharing, including private firms' preference for maintaining the status quo and aversion to comparative ambiguity, and offering suggestions for aligning private information sharing with social optimality). *See also* Coglianese et al., *supra* note 139.

170. *See* Lyndon, *supra* note 1, at 28–34, 55 (discussing the "Pandora's Box" dilemma: a secret is a force which can be released and have unpredictable and irreversible effects).

171. If it unravels, unpredictable chain reactions may occur. The baseline is insecurity, and the stakes are high. The uncertainties may be experienced as

certainty about the negative implications of data tends to be resolved in favor of the firm's control.

4. The Camouflage Factor

Legal rules that are lenient with confidentiality claims will encourage overbroad claims. Industry members share attitudes about revealing negative aspects of their business. When information relates to health and environmental risks, rivals will generally not push for disclosure. Regulation and the liability system simply interfere with the game in unwelcome ways. Moreover, what implicates one may tarnish all. The group dynamics reinforce camouflage incentives.

Scientific information will be treated like any other data. Indeed, because it is often costly or may describe potentially negative or uncertain aspects of substantial investments, scientific data is likely to be withheld.

Delay in disclosure is likely to reinforce the inclination to secrecy. While competitive reasons for nondisclosure may fade, the camouflage function may become more important over time. Even after risk data has become commercially stale, disclosure could trigger unwelcome attention, or even liability.[172] Thus, the secrecy dysfunctions identified by Steven Cheung—pockets of stagnation and a distorted research agenda—may increase over time.[173]

IV. STRONGER EHS ACCESS RULES FOR THE NEW INNOVATION ECONOMY

Regulatory efforts to create a broad library of EHS information available to support participation and learning have been undermined by the application of FOIA's Exemption 4. Agency decision makers are under pressure not to take risks with disclosure, and even where companies in other markets need the information for health and safety reasons, agencies have been hesitant to disclose.[174] Agencies bargain for docu-

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near blindness.

172. *See* Coglianese et al., *supra* note 139; Lyndon, *supra* note 20; Wagner, *supra* note 1.

173. *See* discussion *supra* Part II.A.

174. When OSHA promulgated its Hazard Communication Standard, manufacturers like Caterpillar supported disclosure, and the flavors and fragrances industry opposed it. Even though the Court of Appeals for the Third Circuit instructed

ments and run interference with the public, sanitizing and guarding information that would otherwise be available to assess EHS effects. The very parties that disclosure law is intended to benefit are those most hindered when it comes to challenging an exemption. Increasingly, risk monitoring must work from an incomplete, sequestered, and lumpy archive.

The current rules on EHS disclosure present an incongruous picture, with incentives and access rules the reverse of what they should be. Localized entrepreneurial concerns interfere with the larger community's efforts to cope with the externalities caused by the narrower interests. When viewed in context, it is apparent that limiting access to risk data is inefficient and unfair.

When the law protects short-term commercial uses too strongly, many other interests suffer. Current legal rules encourage overbroad claims, which shift the costs of producing and managing risk data. Often commercial claims are not even assessed for basic legitimacy. Secrecy is expansive, tends to grow and is difficult to monitor. The secrecy option encourages further investments in secrecy, including preferring technologies that can be kept secret. It allows risks and uncertainty to build up over time. Lack of data access means that many risks are not recognized or understood until after they have resulted in substantial harm and are costly to correct.

The analysis presented here suggests that it is time to return to basics. Access and disclosure rules should express the law's long-standing principles of risk communication. It should be clear that there is no privilege to withhold data that is needed for risk management, certainly where the secret keeper contributes to creating the risks. At most, only a narrow and short-term privilege should be allowed to support emerging innovations and new research. At the same time, firms that create risks should be required to produce adequate risk information to describe their products and processes. In fact, as described below, the law is moving in this direction. New approaches to research and knowledge production suggest some formats for programs to achieve a new EHS risk management regime that uses information more efficiently.

OSHA that it had full authority to disclose, the agency hesitated to require disclosure of chemical identity information and burdened challengers to exemption claims with cumbersome procedural requirements. Lyndon, supra note 1, at 26–30.

A. *Access Should Be the Rule and Secrecy the Narrow Exception*

Different rules impose different information burdens.[175] A case-by-case balancing approach to EHS access is too costly. Current law provides for a poor fit between business concerns for secrecy and the larger society's need for EHS learning. It does not calibrate the scope and duration of nondisclosure entitlements to reflect the competing interests in the information. Because of the asymmetries between the organizational, financial, and information resources of the two sides, EHS interests are shortchanged. Balancing effectively becomes a presumption in favor of secrecy. This in turn encourages strategic behavior by firms and produces systemic short-term thinking. Legal support for secrecy and uncertain exemptions from disclosure send the wrong signals to the R&D process, allowing incumbent industries to delay adapting to EHS needs. Firms that produce and distribute chemicals either do have or should have information about them. If the information is not positive, it is better to reveal it earlier and correct course than to wait.

Clarification of the law would reshuffle existing incentives. Removing the option of invisibility would reduce incentives for firms to remain in uncertainty—or to maintain the appearance of uncertainty—about EHS risks. Law that clearly requires firms to disclose information that relates to assessment of risks would establish different R&D dynamics. The market is flexible and innovative. If market actors know they will not be able to keep risky side-effects to themselves, they will incorporate this expectation into their practices. If firms know that at some point in the not too distant future they will have to disclose risk information, they will conduct their research and development and production accordingly.

Some of the difficulties with the law's current compromise stem from the underlying incompatibility between secrecy and learning or research. Although secrecy need not always be incompatible with research, it does need to be narrow and time-limited. Crafting the correct rule for the EHS context will require further consideration. However, the groundwork is al-

175. *See* C. Stephen Bradford, *The Cost of Regulatory Exemptions*, 72 UMKC L. REV. 857 (2004); Clarisa Long, *Information Costs in Patent and Copyright*, 90 VA. L. REV. 465 (2004).

ready laid. Environmental and occupational health and safety laws identify the information that needs to be released for risk management. Time-limited entitlements, based on patent law and copyright, are emerging as essential norms in cutting edge scientific research.[176]

Alternative supports could also be developed by adapting forms that are used in other settings. For instance, regulatory agencies can adjudicate or arbitrate disputes between market rivals over information that must be disclosed for risk management reasons. A mini-patent or registration system could be established for information that is not patentable. The system could require registrants to claim the value and lifespan 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 favorable terms. Violation of the new system's exclusivity provisions could be subject to common law remedial actions.[177]

Once the law re-establishes an appropriate baseline, there would be some residual conflicts between commercial needs and risk management. However, the scale of the problem would be reduced; guarding legitimate but temporary confidentiality interests would be manageable; and ways to manage residual proprietary issues could be devised.

Change is natural to markets and market actors accept that fact. The costs of industrial change may not be as great as industries fear.[178] Experience with requiring environmental improvements suggests that the costs of change may not be as great as industries predict, and that innovations occur in the

176. *See* Jasanoff, *supra* note 31. Some of the current debate among scientists over sharing of data for research purposes and publication of results supports a limited period of exclusivity for emerging innovations and ongoing research.

177. *See* Lyndon, *supra* note 1, at 52–54 & nn. 260–67. Related proposals have been made by McGarity & Shapiro, *supra* note 1, at 883–888 (proposing a variety of reforms including legislatively mandated exclusive use periods and full EHS disclosure). *See also* Wagner, *supra* note 1, at 1717–1745 (proposing reforms including clearer penalties for concealing EHS data, promulgation of clearer standardized information requirements and shifting incentives for information production by imposing penalties for ignorance).

178. *See* MacKay, *supra* note 24, at 2634–2638 ("[I]n a dynamic setting, ventures are undertaken as a function (among other things) of the rights available to recoup the investment."). *See also* Cheung, *supra* note 62 (describing the effect of secrecy options on the choice of R&D paths). For a general discussion of regulatory costs, see Lisa Heinzerling, *Regulatory Costs of Mythic Proportions*, 107 YALE L. J. 1981 (1998) (finding such costs have been distorted in regulatory reform debates).

process of reform.

B. Getting Serious About Researching EHS Effects

More attention to the innovation-stewardship dimension of health and environmental regulation could lead to better institutional arrangements.[179] Limits on pollution and occupational exposures help to create the conditions necessary for responsible technologies to develop. Regulation creates the framework within which R&D works and evokes investment in refinements of technologies already in use. Without regulation to send these signals, the market will yield more technologies that we must study and regulate. Limp regulation also shortchanges our most creative firms, as it makes an easy path for less innovative and demanding firms.

There should be much greater focus on correcting the underlying EHS information deficiencies. Research into EHS effects need not be handled in the backhanded way that conventional regulation has accepted.

Alternative ways of structuring research are emerging. Recognition of the power of information diffusion, is leading to greater use of collaboration and public, network, or "open source" management of information. These developments turn conventional intellectual property rationales on their head, us-

179. 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. Nicola Atkinson & Brad Sherman, *Intellectual Property and Environmental Protection*, 5 EUR. INTELL. PROP. REV. 165 (1991) (addressing this possibility in the European system). Potential adaptations of intellectual property devices have been explored by Professor Frischmann. Brett Frischmann, *Innovation and Institutions: Rethinking the Economics of U.S. Science and Technology Policy*, 24 VT. L. REV. 347 (2000). *See generally* INNOVATION ACTION COUNCIL, ENVTL. PROT. AGENCY, INNOVATING FOR BETTER ENVIRONMENTAL RESULTS: A REPORT ON EPA PROGRESS FROM THE INNOVATION ACTION COUNCIL (2004); Natalie M. Derzko, *Using Intellectual Property Law and Regulatory Processes to Foster the Innovation and Diffusion of Environmental Technologies*, 20 HARV. ENVTL. L. REV. 3 (1996); Michael A. Gollin, *Using Intellectual Property to Improve Environmental Protection*, 4 HARV. J.L. & TECH. 193 (1991); F. Scott Kieff, *Patents for Environmentalists*, 9 WASH. U. J.L. & POL'Y 307 (2002); Gregory Mandel, *Promoting Environmental Innovation with Intellectual Property Innovation: A New Basis for Patent Rewards*, 24 TEMPLE J. SCI. TECH. & ENVTL. L. 219 (2005); Itaru Nitta, *Proposal for a Green Patent System: Implications for Sustainable Development and Climate Change*, 5 SUSTAINABLE DEV. L. & POL'Y 61 (2005).

ing voluntary disclosure of proprietary information and networking to learn and to build new information resources. The old model of the beleaguered innovator who loses out if others copy his work is being supplemented by the realization that "giving away" information may build the knowledge base, so that innovation can go faster and arrive at new creative opportunities.[180] The open source movement in computer programming[181] is the most prominent example, but it is replicated in other programs, such as Wikipedia,[182] a variety of current private collaborations, private-public efforts, and other public projects.

In EHS risk management, the information deficit can be managed on new principles as well. Instead of continuing with the current backward-looking, static model, risk management can emulate those who want to solve puzzles and learn. Significant biomedical research is being conducted collaboratively by public-private consortia, particularly in genomics and proteomics.[183] The projects are structured to support sharing of

180. There is a new literature on information sharing and collaboration. *See, e.g.*, Oren Bar-Gill & Gideon Parchomovsky, *The Value of Giving Away Secrets*, 89 VA. L. REV. 1857 (2003) (in the setting of cumulative innovation that characterizes most industrial sectors, publication rather than patent or secrecy may be the best strategy for original inventors); Yochai Benkler, *Coase's Penguin, or, Linux and the Nature of the Firm*, 112 YALE L.J. 369 (2002); Alex Dontoh, *Voluntary Disclosure*, J. OF ACCT., AUDITING & FIN. 480 (1989) (setting forth a model that elucidates possible explanations for situations in which firms voluntarily disclose unfavorable information); Rochelle Cooper Dreyfuss, *Collaborative Research: Conflicts on Authorship, Ownership, and Accountability*, 53 VAND. L. REV. 1161 (2000) (proposing a framework for rules that blend traditional intellectual property and transactional approaches to support collaborative research).

181. Charles M. Schweik, J. Morgan Grove & Tom P. Evans, *The Open-Source Paradigm and the Production of Scientific Information: A Future Vision and Implications for Developing Countries*, *in* OPEN ACCESS AND THE PUBLIC DOMAIN IN DIGITAL DATA AND INFORMATION FOR SCIENCE: PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM 103–09 (Julie M. Esanu & Paul F. Uhlir, eds., 2004).

Following this model, see the trend in open access journals. *See* Harlan Onsrud, *Overview of Open-Access and Public-Commons Initiatives in the United States*, *in* OPEN ACCESS AND THE PUBLIC DOMAIN IN DIGITAL DATA AND INFORMATION FOR SCIENCE PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM 114–18 (Julie M. Esanu & Paul F. Uhlir eds., 2004); Erik Sandewall, *New and Changing Scientific Publication Practices Due to Open-Access Publication Initiatives*, *in* OPEN ACCESS AND THE PUBLIC DOMAIN IN DIGITAL DATA AND INFORMATION FOR SCIENCE: PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM 110–14 (Julie M. Esanu & Paul F. Uhlir eds., 2004).

182. Wikipedia is a free, online encyclopedia that is written collaboratively by its users. The web site is www.wikipedia.com.

183. These projects make use of open-source computer programming systems, patent pooling, data base sharing, and publication process agreements. Rebecca

early "pre-competitive" research that eventually will provide a platform for new product development.[184] Leading firms are betting that producing and sharing more information will yield greater returns in the long run.[185] The National Research Council's recent report on intellectual property and genomics research calls for the absolute minimum of data withholding and recommends approaches to enhance collaborative research.[186]

Some of the new genomic research should be directly applicable to EHS risk management. This is particularly true of toxicogenomics research,[187] though its promise may be greater

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S. Eisenberg, *Intellectual Property at the Public-Private Divide: The Case of Large-Scale DNA Sequencing*, 3 U. CHI. L. SCH. ROUNDTABLE 557 (1996). Professor Eisenberg describes different approaches to enhancing support for human genome research, including The National Institutes of Health pursuit of early gene patents, the sponsorship by Merck & Co. of a university-based effort to put research information in the public domain, and the profit-nonprofit collaboration established by Dr. J. Craig Ventner. The emergence of collaborative research efforts in biomedicine has generated considerable commentary on data sharing processes and limitations. *See, e.g.*, Rebecca S. Eisenberg & Arti K. Rai, *Harnessing and Sharing the Benefits Of State-Sponsored Research: Intellectual Property Rights and Data Sharing in California's Stem Cell Initiative*, 21 BERKELEY TECH. L. J. 1187 (2006); Diane E. Hoffman & Lawrence Sung, *Future Public Policy and Ethical Issues Facing the Agricultural and Microbial Genomics Sectors of the Biotechnology Industry*, 24 BIOTECH. L. REP. 10 (2005) (surveying policy and legal issues facing research efforts in biotechnology industry).

184. Claire T. Driscoll, Director, Technology Transfer Office, National Human Genome Research Initiative (NHGRI), describes NHGRI's data and research sharing and patent policies for "pre-competitive" biological information, including public-private consortia efforts considered to be "community resource projects," that is, research projects specifically devised and implemented to create particular information or kinds of information. *See* NIH Data and Resource Sharing, Data Release and Intellectual Property Policies for Genomics Community Resource Projects, Expert Opin. Ther. Patents 15(1):1–8 (2005).

185. *See* Eisenberg, *supra* note 183 (describing Merck's strategy).

186. National Research Council, *Reaping the Benefits of Genomic and Proteomic Research: Intellectual Property Rights, Innovation, and Public Health* (2006) (surveying issues relating to secrecy and access, including information sharing, patents and publication options in scientific research). The report recommends maximum sharing of information and suggests some administrative adjustments to the patenting system, to allow for greater development of basic science. *Id.*

187. The field of toxicogenomics is still new and its future shape somewhat uncertain. Optimistic hopes for it include the eventual availability of inexpensive tests for toxicity or at least for physical response to chemical and other stimuli, information which could greatly accelerate health effects research. *See* Jamie A. Grodsky, *Genetics and Environmental Law: Redefining Public Health*, 93 CALIF. L. REV. 171 (2005); Gary E. Marchant, *Genetics in the Courtroom*, 31 SETON HALL L. REV. 949 (2001); Kenneth Olden, *Genomics in Environmental Health Research—Opportunities and Challenges*, 198 TOXICOLOGY 19, 19–24 (2004), *available at* http://linkinghub.elsevier.com/retrieve/pii/S0300483X 04000757. *See also*

than its eventual benefits.[188] Incentives for firms to participate in genomics research vary in different industries. Genomics will open up new product markets for pharmaceutical firms, but it may also reveal negative aspects of drugs already in use. Polluting firms will hesitate to support research that may end their relatively comfortable "uncertainty" about EHS risks. Yet, once pharmaceutical research begins to yield methodological results, these may be applied to EHS risks anyway.[189]

Biomedical research has been the site of both conflict and innovation over secrecy and sharing of information. Professor Sheila Jasanoff describes some of the tensions in the new dynamic relationship between science and society.[190] For researchers on the frontiers of the health sciences, the issues are immediate and the stakes very high. A recent example is the complaint of researchers that some scientists working on avian flu were hoarding information in order to secure publication priority. A group of experts organized a response—a new influenza database that will be publicly available to users who promise not to publish the contents without the permission of the scientist who discovered and contributed the data they want to use.[191]

Another setting in which information sharing is being introduced, though with disappointing results, is critical infrastructure information management (CII). Homeland security legislation has mandated efforts to support private coordination to protect infrastructure from terrorist threats. Information sharing is voluntary in this area. Here, firms lack the forward-looking incentives that energize collaboration in biomedicine. Also, here they are often asked to share within full-

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Michael Waters et al., *Systems Toxicology and the Chemical Effects of Biological Systems CEBS) Knowledge Base*, 111 ENVTL. HEALTH PERSP. 2003, *available at* http://ehp.niehs.nih.gov/txg/members/2003/5971.html (describing toxicogenomics research partnerships).

188. *But see* David E. Adelman, *The False Promise of the Genomics Revolution for Environmental Law*, 29 HARV. ENVTL. L. REV. 117 (2005).

189. For a description of the political and economic obstacles to developing toxicogenomic data to be used in regulatory setting, see Kris Freeman, *Toxicogenomics Data: The Road to Acceptance*, 112 ENVTL. HEALTH PERSP., Aug. 2004, *available at* http://www.ehponline.org/txg/docs/2004/112-12/focus/abstract.html. Freeman remarks that industry response to new efforts to produce genomic data ranges from enthusiasm to extreme caution.

190. *See* Jasanoff, *supra* note 31.

191. Martin Enserink, *New Swiss Influenza Database to Test Promises of Access*, 315 SCIENCE 923 (2007).

blown rivals. The lessons from CII management may be useful in conventional health and environmental risk management.[192]

The EPA's High Production Volume (HPV) Challenge program, organized with the American Chemical Society (ACS) and the non-governmental organization, Environmental Defense, makes use of voluntary and collaborative principles. Under this project, chemical companies sponsor chemicals for which we have inadequate information and pledge to collect or produce tests. This effort has led to the formation of private and voluntary consortia.[193]

The European Union's REACH program goes beyond the HPV Challenge. It requires testing of many more chemicals than current U.S. law requires. Testing is not voluntary and REACH will incorporate an administrative mechanism that will determine the confidentiality status of information.[194] This program is likely to stimulate new ideas and problem-solving in information sharing.

Independent private research programs have also been proposed.[195] New experience with collaborative approaches could make such schemes possible now. There may be a "tipping point," when big firms or firms that are positioned to take advantage of new opportunities in the market see that it is in their interest to contribute to the unraveling of the secrecy and

192. *See* DRAFT NATIONAL INFRASTRUCTURE PROTECTION PLAN: BASE PLAN, DEP'T OF HOMELAND SEC. 56-66 (2005), *available at* http://cipp.gmu.edu/archive/Draft-National-Infrastructure-Protection-Plan-2005.pdf. *But see* J. Scott Marcus, *Evolving Core Capabilities of the Internet*, 3 J. TELECOMM. & HIGH TECH. L. 121 (2004); *Critical Infrastructure Protection Efforts of the Financial Services Sector to Address Cyber Threats*, 7 NO. 9 ELEC. BANKING L. & COM. REP. 21 (2003).

193. Physicians Committee for Responsible Medicine v. Johnson, 436 F.3d 326 (2d Cir. 2006) (describing the EPA's program in context of dispute over program's incentives to conduct new studies, and thus harm additional laboratory animals, rather than requiring disclosure of existing information). *See* Case, *supra* note 20.

194. *See* Alex Scott, *Chemicals Legislation: Is the Industry Ready?*, CHEM. WEEK, Jan. 10, 2007, at 25 (reporting the completion of a final version of the European Union's chemicals testing program, which will affect 30,000 chemicals when it comes into effect in June of 2007). The EU's Registration, Evaluation, and Authorization of Chemicals (REACH) will consist of several phases. In the "authorization" phase, firms with chemicals found to pose a high risk to human health and the environment will be required to submit R&D plans for the development of alternatives to these high risk chemicals. A number of private and public bodies have been developed to assist companies with compliance. *See* Sarah Harrell, *Beyond "REACH"? An Analysis of the European Union's Chemical Regulation Program Under World Trade Organization Agreements*, 24 WIS. INT'L L.J. 471 (2006).

195. See Lyndon, *supra* note 1, at 52–54 & nn. 260–67.

ignorance that has kept risks invisible for so long. If that begins to occur in a serious way, then firms that have resisted it could be at a disadvantage.

Claims of entitlement to information are one form of currency in struggles caused by technical change. Analogous struggles are occurring in other settings, such as the battle between the "old" music industry and the "new" one.[196] If the industries that are the source of EHS risks and uncertainties are not able to change, things may get ahead of them.

The use of "amateurs," or lay experts, in voluntary research and production, based on the Linux/open source model, is becoming more common. As these kinds of collaborations proliferate, we may see better environmental information developing outside of the control of government or polluters. The existing network of private environmental groups is already using the internet to distribute EHS information to the public.[197] A convergence of national health tracking, new chemical identification technology and the availability of relatively inexpensive personal bio-monitoring will yield new patterns of information on chemical exposure.[198] Groups and individuals who are interested in environmental effects, but not necessarily as market participants, are likely to come up with new ways to "reverse engineer" pollution.

These movements belie claims that people already have too much information. Instead, the trend is clearly toward greater

196. Digital technology transformed the music business, in part by making obsolete the centralized manufacture of copies of recordings. The industry was taken by surprise and reacted defensively, trying to keep control over access to musical recordings. The conflict is still being worked out. *See* Gabriel Fitch, *From Napster to Kazaa: What the Recording Industry Did Wrong and What Options Are Left*, 9 J. TECH. L. & POL'Y 183 (2004).

197. Environmental Working Group Home Page, http://www.ewg.org. *See* Jonathan L. Zittrain, *The Generative Internet*, 119 HARV. L. REV. 1974 (2006) (discussing the way the generative capacity for unrelated and unaccredited audiences to build and distribute content through the Internet has facilitated new creative endeavors).

198. *See* Albert C. Lin, *Beyond Tort: Compensating Victims of Environmental Toxic Injury*, 78 S. CAL. L. REV. 1439, 1470–1473 (2005) (new technologies will change tort and regulatory law, as chemical bio-monitoring can detect the extremely low levels of chemicals or their metabolites in small samples of human blood, urine, saliva, or tissue); William H. Rodgers, *Improving Laws, Declining World: The Tort of Contamination*, 38 VAL. U. L. REV. 1249, 1254 (2004) (considering the notion of "normalcy" in a world in which consumers can compare their "body burdens" of mercury, molybdenum, uranium, and other contaminants with other folks living in other parts of the country, though "strategies for unloading these 'body burdens' are not widely known").

sophistication in information management, in systems that draw on the resources of individuals and communities, along with regional, national, and international systems for understanding and managing risks.

CONCLUSION

The law has been going in the wrong direction since it began to retreat from EHS transparency. Patent law, trade secrecy, and business confidentiality concerns do not support a rule that exalts commercial claims over risk management needs. A privilege to cut off access to EHS risk assessment would be an entitlement stronger than a conventional property right, since property entitlements do not legitimate harming others. Even when a commercial claim is legitimate, there are few, if any, circumstances in which it should trump environmental, health, and safety concerns. As a society we have invested in risk management institutions that generate new opportunities to produce and use knowledge. Withholding relevant data from risk management impedes our efforts to understand and avoid risks.