LEGAL HYBRIDS BETWEEN THE PATENT AND COPYRIGHT PARADIGMS†

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TABLE OF CONTENTS

Introduction	2434
(i) Historical Dependence of Intellectual Property Systems on a Substratum of Liability Rules.....	2436
(ii) Failure of the Ancillary Liability Rules and a Prolifera- tion of Legal Hybrids	2442
(iii) Scope of the Current Inquiry	2444
I. Deviations from the Bipolar Structure of the International Intellectual Property System	2448
A. The Dominant Intellectual Property Paradigms.....	2448

† Although Part I is largely derivative of the author's prior works, it is included to add context to his proposal and the commentators' responses.—Eds.

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1994]	<i>LEGAL HYBRIDS</i>	2433
B.	The Proliferation of Legal Hybrids: Selected Case Studies	2453
1.	Selected Marginal Cases in the Spectrum of Industrial and Quasi-Industrial Property	2455
a.	Utility Models.....	2455
b.	Industrial Designs	2459
	(i) Registered Design Protection Laws	2460
	(ii) Unregistered Design Rights	2464
c.	Plant Varieties (UPOV)	2465
d.	Technology Protection in Unfair Competition Law	2472
2.	Selected Marginal Cases in the Spectrum of Artistic and Quasi-Artistic Property	2476
a.	Technical Drawings, Blueprints, and Engineering Projects.....	2477
b.	Integrated Circuit Designs	2478
c.	Industrial Literature: Computer Programs and Electronic Information Tools.....	2480
	(i) A Sui Generis French Law	2481
	(ii) Limits of the "Unity of Literature" Approach	2483
d.	Applied Art and Industrial Designs.....	2488
e.	Factual Compilations and Electronic Databases	2490
	(i) The Nordic Catalogue Rule.....	2492
	(ii) An Extraction Right on Pseudo-Liability Principles	2493
f.	Quasi-Artistic Rights Allied to Copyright Law	2498
C.	Collapse of the Bipolar Structure Underlying the Great Conventions.....	2500
II.	Beyond Art and Inventions: A Default Liability Regime for Applied Know-How.....	2504
A.	Contraction of Lead Time in Design Dependent Technologies	2506
1.	Competition Presupposes Lead Time	2506
2.	Incremental Innovation Bearing Know-How on Its Face	2511
B.	Portable Trade Secrets.....	2519
1.	Nature and Limits of Classical Trade Secret Law	2520
a.	A Market-Driven Liability Regime Regulating Investment in Incremental Innovation.....	2521
b.	Limits of the Standard Regime and the Threat of Market Failure.....	2525
c.	The Public Interest Overwhelmed	2527
2.	A Rationalized Menu of Liability Options	2529

a. Off-the-Rack Liability Rules Allocating Contributions to the Cost of Research & Development	2533
b. The Fair Follower's Menu of Pro-Competitive Legal Options	2539
3. In Search of a Community-Wide Know-How Transaction	2544
a. The Industrial Compilation	2545
b. Artificial Lead Time	2547
c. A Menu of Users' Liabilities	2548
d. Registration with Minimum Disclosure	2551
e. Competition Rules and Technical Standards	2553
f. Collective Action	2555
C. Competition and Innovation in the Post-Industrial Economy	2557

INTRODUCTION

Intellectual property rights, though costly in social terms, stimulate the production of needed inventions and cultural goods that might remain underprotected in a purely free-market system.¹ While different epochs have justified these rights in different ways,² their progressive development has forced both legal and economic thinkers to distinguish between the general domain of ordinary products and processes subject to unrestrained competition and islands of privileged intellectual goods subject to the legal monopolies of intellectual property systems.³ Mediating the traffic between these domains was the historic role of the domestic patent and copyright laws, whose territorial limitations were partially

1. Intellectual property laws typically provide qualified creators with temporary grants of exclusive property rights that derogate from the norms of free competition in order to overcome the "public goods" problem inherent in the commercial exploitation of intangible creations. See Robert P. Benko, *Protecting Intellectual Property Rights—Issues and Controversies* 17–19, 21 (1987); William Kingston, *Innovation, Creativity and Law* 79 (1990); see also Harold I. Dutton, *The Patent System and Inventive Activity During the Industrial Revolution 1750–1852*, at 3–8 (1984); Wendy J. Gordon, *Fair Use as Market Failure: A Structural and Economic Analysis of the Betamax case and its Predecessors*, 82 *Colum. L. Rev.* 1600, 1610–13 (1982); Michael Lehmann, *Property and Intellectual Property—Property Rights as Restrictions on Competition in Furtherance of Competition*, 20 *Int'l Rev. Indus. Prop. & Copyright L.* 1 (1989). The "public good" characteristic of information and intangible creations generally stems from their indivisibility; no single person's consumption diminishes its availability to others. See, e.g., Benko, *supra*, at 17.

2. See Lyman R. Patterson, *Copyright in Historical Perspective* 20–27, 42–142 (1968); Edith T. Penrose, *The Economics of the International Patent System* 1–41 (1951); Paul E. Geller, *Toward an Overriding Norm in Copyright: Sign Wealth*, 159 *Revue Internationale du Droit D'Auteur [R.I.D.A.]* 2, 9–30 (1994).

3. See *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 156–57, 163–68 (1989); *Compco Corp. v. Day-Brite Lighting, Inc.*, 376 U.S. 234, 237–38 (1964); *Sears, Roebuck & Co. v. Stiffel Co.*, 376 U.S. 225 (1964); see also Benko, *supra* note 1, at 18–21; Paul Goldstein, *The Competitive Mandate: From Sears to Lear*, 59 *Cal. L. Rev.* 873 (1971).

overcome in the loosely organized international intellectual property system built around the Paris and Berne Conventions (the "Great Conventions"), signed respectively in 1883 and 1886.⁴

These Conventions represented a normative consensus that evolved⁵ from different countries' approaches to the problem of balancing incentives to create against the public interest in free competition.⁶ More recently, a coalition of technology-exporting countries has elevated the international minimum standards of protection and universalized their application through multilateral trade negotiations that did not depend on such a consensus.⁷ These efforts have renewed critical interest in the economic justifications for intellectual property rights and the extent to which they empirically fulfill their avowed social goals.⁸ In evaluating the implications of these regimes, however, both apologists and critics often

4. See Paris Convention for the Protection of Industrial Property, March 20, 1883, as revised at Stockholm on July 14, 1967, 21 U.S.T. 1583 [hereinafter Paris Convention]; Berne Convention for the Protection of Literary and Artistic Works, Sept. 9, 1886, as last revised at Paris on July 24, 1971, and amended in 1979, S. Treaty Doc. No. 99-27, 99th Cong., 2d Sess. (1986), 828 U.N.T.S. 221 [hereinafter Berne Convention].

5. The Paris and Berne Conventions were revised at periodic intervals up to 1967 and 1971, respectively. See G.H.C. Bodenhausen, Guide to the Application of the Paris Convention for the Protection of Industrial Property as Revised at Stockholm in 1967, at 9-11 (1968); World Intellectual Property Organization, Guide to the Berne Convention for the Protection of Literary and Artistic Works (Paris Act, 1971), at 6 (1978) [hereinafter Guide to the Berne Convention]. For the gradual formation of consensually recognized international minimum standards of protection, see, e.g., Stephen P. Ladas, Patents, Trademarks and Related Rights: National and International Protection 59-94, 1887-88, 1904-05 (1975).

6. The domestic laws of all countries recognize derogations from and limitations on the exclusive rights to exploit intellectual property in order to promote the public interest generally and to ensure adequate levels of competition and continued innovation in particular. See Sam Ricketson, The Berne Convention for the Protection of Literary and Artistic Works: 1886-1986, at 477-548 (1987) (limitations on artistic property rights under Berne Convention); Jean Foyer, Problèmes Internationaux Contemporains des Brevets d'Invention, in 171 L'Académie de Droit International, Recueil des Cours 340, 384, 390-94 (1981) (public interest recognized under the patent system of all countries).

7. See Final Act Embodying the Results of the Uruguay Round of the Multilateral Negotiations, Marrakesh Agreement Establishing the World Trade Organization, signed at Marrakesh (Morocco), April 15, 1994, Annex 1C, Agreement on Trade-Related Aspects of Intellectual Property Rights [hereinafter GATT/TRIPs] in The Results of the Uruguay Round of Multilateral Trade Negotiations—The Legal Text 365-403 (GATT Secretariat ed., 1994); J.H. Reichman, The TRIPS Component of the GATT's Uruguay Round: Competitive Prospects for Intellectual Property Owners in an Integrated World Market, 4 Fordham Intell. Prop., Media & Ent. L.J. 171, 173-78, 191-203, 224-42 (1993) [hereinafter Reichman, TRIPS Component].

8. See Benko, *supra* note 1, at 15-25, 27-35; Carlos A. Primo Braga, The Economics of Intellectual Property Rights and the GATT: A View from the South, 22 Vand. J. Transnat'l L. 243 (1989); Judith C. Chin & Gene M. Grossman, Intellectual Property Rights and North-South Trade 105-06 (National Bureau of Economic Research Working Paper No. 1490, 1990). See generally J.H. Reichman, Intellectual Property in International Trade: Opportunities and Risks of a GATT Connection, 22 Vand. J. Transnat'l L. 747, 751-68 (1989) [hereinafter Reichman, GATT Connection].

assume the continued existence of a nineteenth-century bipolar structure⁹ rooted in patent and copyright protection.¹⁰ This Article disputes that assumption. It questions whether the real objects of contemporary intellectual property protection still conform empirically to the classical model, and to the extent that they do not, this Article investigates the causes of the deviant phenomena it brings to the forefront of attention.

(i) *Historical Dependence of Intellectual Property Systems on a Substratum of Liability Rules.* — The legal regulation of technical innovation¹¹ in free-market economies has always combined principles drawn from four artificially disarticulated legal subcultures: intellectual property laws, trade secret laws (or equivalent laws protecting confidential information), anti-trust laws, and unfair competition laws that subsume the protection of trademarks and allied disciplines.¹² Trade secret laws,¹³ for example, discourage industrial espionage and provide some incentives for investment in unpatentable, noncopyrightable innovation.¹⁴ Even when courts find

9. See Paris Convention, *supra* note 4; Berne Convention, *supra* note 4. The term "bipolar structure" refers broadly to the division between industrial property rights (including patents, trademarks, and unfair competition protection) covered by the Paris Convention and literary or artistic property rights covered by the Berne Convention.

10. Both camps tend to ignore the proliferation of hybrid intellectual property regimes that deviate from the patent and copyright models. See *infra* notes 91–381. For notable exceptions, see Rochelle C. Dreyfuss, *Information Products: A Challenge to Intellectual Property Theory*, 20 N.Y.U. J. Int'l L. & Pol. 897, 908–12 (1988); Ejan Mackaay, *Economic Incentives in Markets for Information and Innovation*, 13 Harv. J.L. & Pub. Pol'y 867, 901–03, 906–09 (1990).

11. In this article, the term "innovation" is used in the broadest sense of introducing new things or ideas, as contrasted with imitation of existing things or ideas. See, e.g., Richard R. Nelson & Sidney G. Winter, *An Evolutionary Theory of Economic Change* 286 (1982). While innovation in this sense may or may not be legally patentable, see 17 U.S.C. §§ 102, 103 (1988), it usually denotes unpatented or doubtfully patentable technological outcomes. The term "inventions" always refers to legally patentable subject matter.

12. See Spencer W. Waller, *International Trade and U.S. Antitrust Law* § 9.01 (1994); Hanns Ullrich, *Patents and Know-How, Free Trade, Interenterprise Cooperation and Competition Within the Internal European Market*, 23 Int'l Rev. Indus. Prop. & Copyright L. 583 (1992); see also Janusz A. Ordover, *A Patent System for Both Diffusion and Exclusion*, J. Econ. Persp., Winter 1991, at 43–59.

13. "A trade secret may consist of any formula, pattern, device or compilation of information which is used in one's business, and which gives him an opportunity to obtain an advantage over competitors who do not know or use it." Restatement of Torts § 757 cmt. b (1939). See John C. Stedman, *Trade Secrets*, 23 Ohio St. L.J. 4 (1962); see also Unif. Trade Secrets Act § 1(4), 14 U.L.A. 438 (1985) [hereinafter UTSA] (adopted by a majority of states). There is no federal law regulating trade secrets.

14. To the extent that trade secret law discourages industrial espionage, unethical behavior, corruption, and unjust enrichment, it logically falls within the general law of unfair competition, which is where the American Law Institute collocates it. See Restatement (Third) of Unfair Competition §§ 39–45 (Tentative Draft No. 4, 1993). Trade secret laws also provide some incentive for unpatentable, noncopyrightable innovation, see, e.g., *Rockwell Graphic Sys. v. Development Indus.*, 925 F.2d 174 (7th Cir. 1991); David D. Friedman et al., *Some Economics of Trade Secret Law*, J. Econ. Persp., Winter 1991, at 61, 64, while promoting the economically efficient exploitation of information by encouraging the dissemination of ideas through confidential disclosures.

no enforceable violation of trade secret law, the wrongful disclosure of confidential information may constitute an independent ground for liability.¹⁵ Unfair competition laws prohibit business practices that confuse or deceive consumers, and thus enable consumers to match quality products with their respective producers.¹⁶ Principles drawn from antitrust law limit the contractual exercise of proprietary rights in patents, copyrights, trademarks, and industrial know-how while attenuating their inherent anticompetitive effects.¹⁷ A reevaluation of intellectual property rights must recognize the interplay of these disciplines in different economic environments in order to represent accurately the balance between legal incentives to create and free competition. At the same time, the different policies at stake in each of these often competing legal subcultures (and the conflicting interests of sovereign states at different stages of development) have made the prospects for an integrated regulatory framework that would also accommodate future innovation inauspicious throughout most of the twentieth century.¹⁸

See Edmund W. Kitch, *The Law and Economics of Rights in Valuable Information*, 9 J. Legal Stud. 683, 699-70 (1980).

15. See, e.g., *E.I. DuPont de Nemours Powder Co. v. Masland*, 244 U.S. 100 (1917) (enjoining defendant from using or disclosing secret processes that he learned through prior employment, even though these processes do not merit trade secret protection); *Roboserve, Ltd. v. Tom's Foods, Inc.*, 940 F.2d 1441, 1456 (11th Cir. 1991); Jay Drafter, Jr., *Intellectual Property Law: Commercial, Creative and Industrial Property* § 4.05 [1][a], [b], [c] (1994) (discussing confidential relationships in employment and other contexts). But see Restatement (Third) of Unfair Competition, *supra* note 14, § 41 cmt. c (criticizing these cases and preferring broad definition of trade secret in most cases).

16. See, e.g., Restatement (Third) of Unfair Competition, *supra* note 14, § 1 (recognizing entrepreneur's freedom to compete without liability, excepting acts or practices pertaining to "deceptive marketing," "infringement of trademarks and other indicia of identification," and "appropriation of trade values"); Ladas, *supra* note 5, § 885, at 1677. Laws protecting trademarks, trade names, trade dress, service marks, and geographical appellations of origin are specialized applications of general unfair competition norms that enable consumers to identify products and their sources. See, e.g., Stanley M. Besen & Leo J. Raskind, *An Introduction to the Law and Economics of Intellectual Property*, J. Econ. Persp., Winter 1991, at 3, 20-21; Stephen P. Ladas, *Industrial Property and Economic Development*, 45 Trademark Rep. 615, 633 (1955); see also William M. Landes & Richard A. Posner, *Trademark Law: An Economic Perspective*, 30 J.L. & Econ. 265, 269-70 (1987).

17. See, e.g., Martin J. Adelman, *The Supreme Court, Market Structure, and Innovation*, 27 Antitrust Bull. 457, 459 (1982); Louis Kaplow, *The Patent-Antitrust Intersection: A Reappraisal*, 97 Harv. L. Rev. 1815 (1984); Leo J. Raskind, *Licensing Under United States Antitrust Law*, 20 Brook. J. Int'l L. 49 (1993). See generally William C. Holmes, *Intellectual Property and Antitrust Law* chs. 11-38 (1993); Symposium, *Intellectual Property and Competition Law: Changing Views in the European Community and the United States of America*, 20 Brook. J. Int'l L. 1 (1993) [hereinafter *Intellectual Property and Competition Law Symposium*].

18. See Ernst-Ulrich Petersmann, *International Competition Rules for the GATT-WTO World Trade and Legal System*, J. World Trade, Sept. 1993, at 35, 35-41 (stressing parochial disregard for a more coherent approach to a quintessentially transnational set of problems); J.H. Reichman, *Beyond the Historical Lines of Demarcation: Competition Law, Intellectual Property Rights, and International Trade After the GATT's Uruguay*

Legal theorists have particularly underestimated the important role of trade secret laws (or equivalent laws of confidentiality) in mediating between formal intellectual property regimes and free competition.¹⁹ These laws do not confer exclusive property rights in the manner of patent and copyright laws,²⁰ but they do require would-be competitors to extract an innovator's undisclosed know-how by proper methods of reverse engineering.²¹ For these purposes, know-how represents the fund of detailed, practical information and experience that an enterprise acquires, often by trial and error, in the use and application of industrial techniques.²² Permissible reverse engineering occurs when a second comer starts with the known product and works backwards to derive the process that aided in its development or manufacture.²³ Second comers who cannot extract valuable undisclosed information by proper means or independently reach similar solutions must acquire the unpatented

Round, 20 Brook. J. Int'l L. 75, 87-94, 99-104, 107-15 (1993) [hereinafter Reichman, *Beyond the Historical Lines*].

19. International intellectual property law did not recognize trade secrets as such, and trade secret laws are not mentioned in the Paris Convention, which does require minimum international standards of unfair competition law sounding in the confusion and deception rationales. See Paris Convention, *supra* note 4, arts. 10*bis*, 10*ter*; Reichman, GATT Connection, *supra* note 8, at 769-96. However, the Uruguay Round of multilateral trade negotiations has now made the protection of undisclosed information a binding obligation of international trade law, which could necessitate enactment of a federal trade secret law in the United States. See GATT/TRIPS, *supra* note 7, art. 39; Reichman, TRIPS Component, *supra* note 7, at 236-39.

20. Despite certain "property-like" qualities, "liability for the appropriation of a trade secret rests on a breach of confidence or other wrongful conduct in acquiring, using, or disclosing secret information." Restatement (Third) of Unfair Competition, *supra* note 14, § 39 cmt. a; see also *id.* § 40. Assuming that undisclosed but sufficiently definite information fits within the operative definition of a trade secret, see *supra* note 13, and reasonable precautions are taken to preserve its secrecy, trade secret law confers no exclusive rights to make, to use, to sell, or to reproduce it in the manner of patents or of other statutory intellectual property rights. See *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 160 (1989); *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 476, 490 (1974); UTSA, *supra* note 13, § 1(4), 14 U.L.A. at 438.

21. See, e.g., UTSA, *supra* note 13, § 1(2), 14 U.L.A. at 438; Stedman, *supra* note 13, at 8 (trade secrets not protected when the information is independently discovered or when obtained by analysis or inspection of publicly distributed products).

22. See Ladas, *supra* note 5, § 867, at 1617 (stating that know-how is the "knowledge of how to organize a certain production in the most efficient and competitively advantageous manner"). Professor Magnin stresses that know-how is not an isolated technique or formula, but rather the entire industrial process from choice of raw materials to modalities of distribution, a "manufacturing art." See François Magnin, *Know-How et Propriété Industrielle* 114 (1974); see also François Dessemontet, *The Legal Protection of Know-How in the United States of America* 11, 16 (H.W. Clarke trans., 2d ed. 1976); Alois Troller, *The Protection of Know-How: General Report, in The Protection of Know-How in 13 Countries* 149, 150, 152 (Herman Cohen Jehoram ed., 1972).

23. See *Kewanee Oil*, 416 U.S. at 476. Independent creation or derivation refers to the discovery of a trade secret, the development of a process, or the creation of a product without unlawful reliance on another's proprietary information. See, e.g., UTSA, *supra* note 13, § 1(2), 14 U.L.A. at 438; *id.*, Commissioner's Comment, at 438.

know-how through licensing agreements with innovators.²⁴ Either way, these legal requirements normally provide those who develop unpatented, noncopyrightable innovation with a period of natural lead time in which to recover their investments while establishing their reputations as producers of quality goods.²⁵ This capacity of individual innovators who rely on legal secrecy to recoup the costs of "subpatentable inventions . . . that fall below the congressional standard for patentability"²⁶ also ensures that second comers contribute directly or indirectly to the relevant technical community's aggregate costs of research and development in given technological fields.²⁷

On the margins of the pure market economy envisioned by nineteenth-century liberal economic thought,²⁸ trade secret laws (and related laws protecting confidential information) thus provide a loosely constructed set of liability rules²⁹ that reinforce the competitive ethos in subtle and indirect ways. These modified or quasi-liability rules mediate be-

24. See, e.g., *Aronson v. Quick Point Pencil Co.*, 440 U.S. 257, 260 (1979) (licensee willing to pay for revelation of licensor's secret, whether patent upheld or not, validly acquired lead time); Rochelle C. Dreyfuss, *Dethroning Lear: Licensee Estoppel and the Incentive to Innovate*, 72 Va. L. Rev. 677, 696-700 (1986) (explaining economic advantages of acquiring licensor's lead time through licensing agreement).

25. See, e.g., Ralph S. Brown, *Design Protection: An Overview*, 34 UCLA L. Rev. 1341, 1388 (1987) ("[T]he originator will have had a head start. That is often the only advantage our system grants . . . and it is often enough . . ."); Dreyfuss, *supra* note 24, at 698-700 (lead time often allows first producer to earn substantial supra-competitive profits on innovation even in the absence of patent or trade secret protection); Stedman, *supra* note 13, at 25; see also Richard C. Levin et al., *Appropriating the Returns from Industrial Research and Development*, 1987 Brookings Papers on Economic Activity 783, 784.

The term "natural lead time," though analogous to the economists' "head start," see Stedman, *supra* note 13, at 25, is chosen to emphasize the extent to which implementation of the governing legal regimes—trade secret law and the law of confidential information—depends upon real world events and not legally determined outcomes, such as a fixed term of duration. Natural lead time depends on the individual business decisions and strategies of both innovators and borrowers, not on the dictates of legal rules.

26. Dreyfuss, *supra* note 24, at 696.

27. Cf. Giovanni Dosi et al., *The Economics of Technical Change and International Trade* 82-89 (1990); Richard Nelson & Sidney Winter, *In Search of a Useful Theory of Innovation*, 6 Res. Pol'y 36 (1977) (theory of technological trajectory).

28. See, e.g., Penrose, *supra* note 2, at 2-8 (discussing patent controversy of the nineteenth century).

29. See Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 Harv. L. Rev. 1089, 1092 (1972). The authors explain:

An entitlement is protected by a property rule to the extent that someone who wishes to remove the entitlement from its holder must buy it from him in a voluntary transaction in which the value of the entitlement is agreed upon by the seller. . . . Property rules involve a collective decision as to who is to be given an initial entitlement but not as to the value of the entitlement.

Whenever someone may destroy the initial entitlement if he is willing to pay an objectively determined value for it, an entitlement is protected by a liability rule [Such] rules involve an additional stage of state intervention: not only are entitlements protected, but their transfer or destruction is allowed on the

tween the potential for overprotection inherent in the statutory grants of exclusive property rights and the potential for underprotection inherent in the competitor's unfettered ability to appropriate the fruits of investment in unpatented incremental innovation.³⁰ The temporary or "disappearing" quantum of natural lead time they provide solves the free-rider problem³¹ that would otherwise skew decisions to invest in the development of unpatented, noncopyrightable products and processes, without resort to arbitrarily imposed barriers to entry characteristic of all regimes built around exclusive property rights.³² In the presence of natural lead time, the pace and direction of incremental innovation depend on countless individual business strategies and decisions made in the face of a common condition of uncertainty about the value of any given innova-

basis of a value determined by some organ of the state rather than by the parties themselves.

Id. As regards trade secret protection, the initial "entitlement" appears property-like at first glance because it carries a limited right to enjoin rapid duplication or imitation of unpatented innovation by improper means. This entitlement frees innovators from the socially wasteful costs of securing their undisclosed know-how from such assault. See *supra* note 20. However, the essence of a property rule for Calabresi and Melamed is that a third party cannot circumvent it without the owner's consent. In contrast, trade secret law presents a double option in the sense that a third party may either obtain consent or reverse engineer by means that do not depend on consent at all. In this respect, trade secret law behaves like a liability rule (or quasi-liability rule), with the added wrinkle that the rate or value of the entitlement is determined by the market and not by government intervention. Nevertheless, the consent of the owner is not a prerequisite, as with Calabresi's liability rule; the objectively determined value that allows a second comer to extinguish this entitlement is the (variable) cost of reverse engineering by proper means. At the same time, the initial entitlement may be purchased whenever a second comer expects greater advantages to accrue from a voluntary acquisition of the innovator's lead time in lieu of actually incurring those costs. Cf. Calabresi & Melamed, *supra*, at 1100-01 ("[W]e either have the right to our own property or body or the right to have others' property or bodies. We may buy or sell ourselves into the opposite position . . .").

30. Cf. Calabresi & Melamed, *supra* note 29, at 1093 (stating that "most entitlements to most goods are mixed"); *id.* at 1107-08 (noting risk of under- or overcompensation from use of property rights without sound basis for *ex ante* valuation).

31. See Stedman, *supra* note 13, at 21; cf. Calabresi & Melamed, *supra* note 29, at 1095, 1095 n.13 (emphasizing potential costs of excluding free-riders from the fruits of market bargains); Wendy J. Gordon, *Asymmetric Market Failure and Prisoner's Dilemma in Intellectual Property*, 17 U. Dayton L. Rev. 853, 854-59 (discussing conditions for market failure).

32. See, e.g., Levin et al., *supra* note 25, at 793-96 (showing lead-time and learning curve advantages are even more important in protecting competitive advantages of new or improved processes and products than patents). *A fortiori*, absent patents and copyrights, one expects these factors to become virtually indispensable.

tion,³³ and there is a built-in bias favoring investment in improvements and new applications at the expense of copycat manufacturing.³⁴

On the negative side, this substratum of modified liability rules entails appreciable social costs of its own.³⁵ It is also singularly prone to yield arbitrary and irrational results whenever the task of reverse engineering unpatented, noncopyrightable innovation proves either too difficult or too easy.³⁶ When reverse engineering becomes too hard, innovators effectively obtain a perpetual monopoly irrespective of the social importance of their contributions,³⁷ unless the availability of patent protection induces public disclosure of the discovery in question.³⁸ When reverse engineering proves too easy, second comers who exert only trivial efforts may appropriate an originator's investment in research and development even when the resulting product or process contributes significantly to social welfare.³⁹ If the second comer then drives the innovator out of the market by selling the same innovation at prices below the latter's average costs, the short-term social benefits of lower prices mask the

33. See Nelson & Winter, *supra* note 27 (economic problem of optimizing production encounters fact that "choice sets are not given and the consequences of any choice are unknown"); see also Ejan Mackaay, *An Economic View of Information Law*, in *Information Law Towards the 21st Century* 43, 58 (Willem F. Korthals Altes et al. eds., 1992) (stressing difficulty *ex ante* of matching producers and users interests in the production of information and predicting that industry itself will strike experimental balances).

34. See, e.g., Levin et al., *supra* note 25, at 805-07 (stressing likelihood of improvements from reverse engineering).

35. See *infra* note 410 and accompanying text.

36. See Steven N.S. Cheung, *Property Rights in Trade Secrets*, 20 *Econ. Inquiry* 40, 44 (1982); see also Wendy J. Gordon, *An Inquiry into the Merits of Copyright: The Challenges of Consistency, Consent, and Encouragement Theory*, 41 *Stan. L. Rev.* 1343, 1465-69 (1989).

37. See Gordon, *supra* note 36, at 1466 (contrasting the perpetual ability to conceal a recipe for a soft drink that cannot be reverse engineered with the impossibility of preventing any one from imitating a newly invented safety pin). In these cases, the arbitrariness of the outcome often depends on the accidental benefits of actual secrecy as distinct from outcomes determined by the rules governing legal secrecy. See, e.g., Rebecca S. Eisenberg, *Proprietary Rights and the Norms of Science in Biotechnology Research*, 97 *Yale L.J.* 177, 190-91 (1987).

38. See, e.g., Rebecca S. Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, 56 *U. Chi. L. Rev.* 1017, 1028-30 (1989). The ability to maintain secrecy in the absence of patents has diminished with the demise of the solitary inventor and the rise of team research. See, e.g., David E. Korn, *Patent and Trade Secret Protection in University-Industry Research Relationships in Biotechnology*, 24 *Harv. J. Legis.* 191, 193-99, 221-23 (1987).

39. See, e.g., Eisenberg, *supra* note 37, at 193 ("Microorganism cultures are especially difficult to maintain as trade secrets because they are easily stolen without detection and propagate rapidly. A small sample of a culture can supply a competitor with bountiful quantities of commercially valuable organisms."); Korn, *supra* note 38, at 221-22. See also National Commission on New Technological Uses of Copyrighted Works (CONTU), *Final Report 17* (1978) [hereinafter *CONTU Final Report*] (trade secret protection of computer programs sold in multiple copies over the counter to consumers at large is lost through public dissemination).

long-term social costs of rendering investment in unpatentable innovation too unattractive to risk-averse, equally vulnerable members of the relevant technical communities.⁴⁰

In dynamic economies driven by constant technological innovation,⁴¹ competition with respect to the products and processes of routine innovation thus presupposes a degree of natural lead time, which classical trade secret law is presumed to supply.⁴² Absent natural lead time, however, investment in innovative but unpatentable applications of science to industry tends to dry up, and competition may languish in the face of a progressive market failure.⁴³ As will be seen, the likelihood that this type of market failure will occur has greatly increased during the second half of the twentieth century.

(ii) *Failure of the Ancillary Liability Rules and a Proliferation of Legal Hybrids.* — Even during the nineteenth century, the propensity of these ancillary liability rules to yield insufficient lead time in certain industrial sectors induced legislators in different countries to adopt asystemic forms of relief that deviated from the standard patent and copyright models. When, for example, competitors began to duplicate commercially valuable product configurations or certain functional improvements in handtool designs, some countries enacted sui generis design laws or util-

40. See, e.g., Cheung, *supra* note 36, at 41.

41. See, e.g., Nelson & Winter, *supra* note 27; see also Joseph A. Schumpeter, *Capitalism, Socialism and Democracy* 87–106 (6th ed. 1987).

42. As the *Kewanee* Court stated: “[t]rade secret law will encourage invention in areas where patent law does not reach, and will prompt the independent innovator to proceed with the discovery and exploitation of his invention. Competition is fostered and the public is not deprived of the use of valuable, if not quite patentable, invention.” *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 485 (1974).

43. Market failure results from the indivisibility of information and from the inability to exclude anyone else who acquires it from putting it to his or her own uses. See, e.g., Kenneth Arrow, *Economic Welfare and the Allocation of Resources For Invention*, in *National Bureau of Economic Research, The Rate and Direction of Inventive Activity: Economic and Social Factors* 609–25 (1962). See generally Francis M. Bator, *The Anatomy of Market Failure*, 72 *Q.J. Econ.* 351 (1958). But see Peter G. Brown, *The Failure of Market Failures*, 21 *J. Socio-Econ.* 1, 2–6 (1992).

Technically, this “public good” aspect of intangible creations may be seen as one of four causes of market failure in the sense of less than Pareto efficiency; the others are monopoly, external effects, and informational asymmetry. See, e.g., Robert Cooter & Thomas Ulen, *Law and Economics* 45–49 (1988). As specifically regards intellectual creations, Professor Gordon identifies both an initial condition of market failure stemming from appropriability (and its consequent free-rider problem) and a subsequent condition due to the inability of users or other second comers to form markets once creators obtain incentives to overcome the free-rider problem. See, e.g., Gordon, *supra* note 31, at 854–59; see also Wendy J. Gordon, *On Owning Information: Intellectual Property and the Restitutionary Impulse*, 78 *Va. L. Rev.* 149, 223–24, 230–38 (1992).

In this Article, the term “market failure” applies to either or both of the conditions that Professor Gordon identifies. Particular attention is given to promoting interactions between users and innovators that facilitate licensing with, one contends, more acceptable administrative costs than under other solutions.

ity model laws to provide the affected industries with incentives to create.⁴⁴

If one considers these early deviant cases in light of later developments examined in this study, a number of salient points stand out. First, early market failures of this kind were sufficiently infrequent that they did not distract attention from the primary task of developing the mature patent and copyright paradigms. Second, the characteristic response to any given instance of market failure deemed worthy of corrective action was to codify *sui generis* regimes of exclusive property rights, built on modified patent or copyright principles, that overcame the lack of natural lead time and established incentive structures to reward and stimulate innovators in the fields concerned.⁴⁵ Third, these *ad hoc* legislative responses often failed to yield the desired results in practice and tended instead to install states of chronic under- or overprotection.⁴⁶ Finally, these shortcomings caused little general concern, because the conditions that generated the specific market failures in question were perceived as relatively minor anomalies that did not significantly affect the normal operations of the domestic and international intellectual property systems.

By the end of the twentieth century, however, this last perception had changed radically owing to the advent of new, information-based technologies, including computer science and biogenetic engineering, whose industrial applications were costly to develop but vulnerable to rapid duplication.⁴⁷ The occasional lack of natural lead time that troubled certain design-dependent industries at the end of the nineteenth century has become a generalized contraction of natural lead time afflicting investors in some of the economically most important new technologies that are equally design-dependent. Incremental advances in technical know-how emanating from these nontraditional forms of innovation fit imperfectly within the patent and copyright paradigms. Yet, because they become embodied in products distributed in the open market, the domestic trade secret laws often fail to impede second comers from appropriating these same advances without incurring the time and costs of reverse engineering.⁴⁸

44. See Jerome H. Reichman, *Design Protection and the New Technologies: The United States Experience in a Transnational Perspective*, 19 U. Balt. L. Rev. 6, 20–25, 37–42 (1989/1990) [hereinafter Reichman, *The United States Experience*] (comparing domestic and foreign law).

45. See, e.g., *infra* text accompanying notes 98–195, 226–337, 344–345. However, there was one relatively successful response that took the form of a modified liability rule rather than an exclusive property right. See *infra* text accompanying note 225 (engineering projects in Italian intellectual property law).

46. See *infra* text accompanying notes 144, 396–401.

47. See *supra* note 39. For the information-based aspects of biogenetically engineered products, see *infra* note 445 and accompanying text.

48. See Jerome H. Reichman, *Electronic Information Tools—The Outer Edge of World Intellectual Property Law*, 24 Int'l Rev. Indus. Prop. & Copyright L. 446, 472 (1993) [hereinafter Reichman, *Electronic Information Tools*].

This study thus confirms that incremental innovation bearing know-how on its face has become a dominant characteristic of key technological paradigms evolving at the end of the twentieth century. To avoid the underinvestment in research and development of unpatentable innovation likely to ensue from a pervasive contraction of lead time in advanced technological sectors, the world's intellectual property system and the domestic competition laws with which it is allied have come under intense pressure from special interests seeking to obtain artificial lead time through one legal device or another.⁴⁹ As will be seen, governments tend to respond by extending patent and copyright laws to protect subject matter for which these laws were not intended⁵⁰ or by implementing hybrid legal regimes that grant exclusive property rights to new objects of protection that fall outside of the classical legal framework. These ad hoc efforts to accommodate nontraditional forms of innovation have spawned a proliferation of restraints on trade that strain the international intellectual property system to the breaking point⁵¹ and weaken the competitive ethos from within.

(iii) *Scope of the Current Inquiry.* — Properly understood, the inability of the nineteenth-century international intellectual property system to accommodate the growing array of marginal cases reviewed in this Article represents a failure of classical trade secret laws under modern conditions and not a collapse of the patent and copyright paradigms applied to their

49. See, e.g., Joseph Jehl, *Le Commerce International de la Technologie: Approche Juridique* 79 (1985), who states:

[T]he protection of know-how tends to approach that conferred on patents. The latter serves as a kind of reference point. Firms are trying to win recognition of an exclusive right to their know-how that is of the same nature as a patent. Their efforts aim in effect to obtain a right to be exercised against third parties, in general. One can therefore declare that the protection of know-how completes and imitates that of patents.

Id. at 110 (trans.); see also William Kingston, The "Thesis" Chapters, in *Direct Protection of Innovation* 21-33 (William Kingston ed., 1987) (regretting that the nonobviousness criterion of patent laws excludes bulk of merely incremental innovation, and advocating direct protection of unpatentable innovation as such).

For similar pressures on the domestic competition laws, see, e.g., Reichman, *Beyond the Historical Lines*, *supra* note 18, at 85-94. See generally *Intellectual Property and Competition Law Symposium*, *supra* note 17, at 1-168.

50. See, e.g., Dan L. Burk, *Biotechnology and Patent Law: Fitting Innovation to the Procrustean Bed*, 17 *Rutgers Computer & Tech. L.J.* 1, 24-84 (1991); Pamela Samuelson, *CONTU Revisited: The Case Against Copyright Protection for Computer Programs in Machine-Readable Form*, 1984 *Duke L.J.* 663, 705-754.

51. See, e.g., Adolph Dietz, *Copyright in the Modern Technological World: A Mere Industrial Property Right?*, 39 *J. Copyright Soc'y* 83, 88-89 (1991); David Ladd, *To Cope With the World Upheaval in Copyright*, 19 *Copyright: Monthly Review of the World Intellectual Property Organization* 289, 290-91, 293 (1983) ("strains upon copyright . . . becoming increasingly international in character" owing to interaction of technologies, such as "broadcast and satellite transmissions, computer and computer-controlled optical disk storage and retrieval, and . . . technology for large-scale pirating," which transcend purely domestic approaches).

traditional objects of protection.⁵² Tinkering with the dominant paradigms or concocting hybrid variants lacking any solid theoretical or economic foundations merely aggravates the long-term disutilities resulting from a progressive inability of ancillary liability rules, rooted in the domestic laws, to mediate effectively between legal incentives to create and free competition.

To sustain optimum investment in the production of high technological goods and services without creating market-distorting legal monopolies, reformers should elaborate an improved set of ancillary liability rules. These rules should emulate the functions of classical trade secret law while rationalizing and adapting its modalities to current conditions. Besides affording artificial lead time to incremental innovators, a rationalized liability regime would allow second comers to use the formers' unpatented innovation to develop socially desirable innovation of their own, on the condition that they contributed, directly or indirectly, to the innovators' research and development costs. This new intellectual property paradigm should provide a limited, nonexclusionary form of relief for innovators who routinely apply unpatented, noncopyrightable know-how to publicly distributed industrial products.⁵³ It would thereby bridge the gap between the mature patent and copyright paradigms without creating new barriers to entry or other anticompetitive effects characteristic of regimes implementing exclusive intellectual property rights.⁵⁴

If this thesis proves correct, it means that the economic premises underlying the classical intellectual property paradigms increasingly yield socially questionable results. The proliferating legal hybrids examined below represent both a consequence of this growing incoherence and a cause of the incipient breakdown that is weakening the international intellectual property system from within. Current analysis of these phenomena has been hindered by insufficient attention to an historical or comparative perspective and by lobbying efforts that portray each new technology as either consistent or inconsistent with standard objects of

52. While the patent and copyright paradigms are not free of difficulties, these difficulties entail a further working out of their internal implications under changing conditions. These problems largely affect scope-of-protection issues. See, e.g., Paul E. Geller, *Must Copyright Be For Ever Caught Between Marketplace and Authorship Norms?*, in *Of Authors and Origins—Essays on Copyright Law* 159, 170–201 (Brad Sherman & Alain Strowel eds., 1994); Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 *Colum. L. Rev.* 839, 884–916 (1990); Marci A. Hamilton, *Art Appropriation: Three Models and a Trend in Copyright Law* (forthcoming 1994) (on file at Columbia Law Review).

53. The term "relief" is deliberately used instead of the term "protection" to denote the use of softer liability rules, rather than exclusive rights, to achieve a new equilibrium between originators and innovators without incurring the social costs of exclusive property rights. Cf. Calabresi & Melamed, *supra* note 29, at 1093–98 (discussing use of entitlements to promote economic efficiency).

54. See Cooter & Ulen, *supra* note 43, at 1350.

intellectual property protection, depending on the legislative strategy of powerful interests at any given time.⁵⁵

To document these trends, Part I reviews briefly the bipolar structure of classical intellectual property law. It then describes nonstandard objects of protection that deviate from the economic and behavioral assumptions underlying the patent and copyright paradigms. A comparison of hybrid legal solutions devised for early marginal cases with those in more recent times reveals their common traits. Identifying this shared pattern of behavior deepens our understanding of the nature and function of the deviant field as a whole and of the severe consequences of inadequately addressing prior systemic anomalies.

Part II argues that the failure of the world intellectual property system to accommodate these marginal cases stems primarily from the structure of domestic trade secret laws. These laws increasingly fail to provide adequate lead time when design-rich applications of scientific and technical know-how are embodied in industrial products sold on the open market. This Part accordingly proposes a third intellectual property paradigm to regulate publicly distributed embodiments of technical information that neither patent laws nor classical trade secret laws adequately protect. This proposed regime, loosely derived from classical trade secret law and from antitrust principles applicable to two-party transfers of unpatented industrial know-how, aims to avoid market failure without introducing the market distortions characteristic of intellectual property rights and without forfeiting the pro-competitive social benefits that result from trade secret laws under optimum conditions. It solves the free-rider problem facing growing numbers of investors in applied know-how by directly linking the prospects for short-term returns on investment to the stipulation of a standard, multi-party set of default rules applicable to eligible forms of innovation.⁵⁶ This standard menu of options would provide eligible innovators with short, flexible periods of artificial lead time while allowing competitors to enter substitute, prefabricated transactions that permit them to use and to exploit the originator's know-how in return for specified contributions to the costs of research and development.

55. Compare Anthony L. Clapes [Senior Counsel, IBM] et al., *Silicon Epics and Binary Bards: Determining the Proper Scope of Copyright Protection for Computer Programs*, 34 *UCLA L. Rev.* 1493, 1575-84 (1987) (advocating strong copyright protection for computer programs) with Elmer Galbi [senior patent attorney, IBM], *Proposal for New Legislation to Protect Computer Programming*, 17 *Bull. Copyright Soc'y*, 280, 280-81 (1969) (advocating sui generis protection of computer programs).

56. A "default" rule refers to a standard, unbargained-for term that the law implies into contracts unless the contracting parties explicitly agree to vary it. See, e.g., Ian Ayres & Robert Gertner, *Filling Gaps in Incomplete Contracts: An Economic Theory of Default Rules*, 99 *Yale L.J.* 87 (1989); Jason S. Johnston, *Strategic Bargaining and the Economic Theory of Contract Default Rules*, 100 *Yale L.J.* 615 (1990); see also Symposium on Default Rules and Contractual Consent, 3 *S. Cal. Interdisciplinary L.J.* 1 (1994).

The proposed solution seeks to alleviate the tensions currently building within the world intellectual property system by accommodating past and present marginal cases without the economic imbalances that arise from misapplying the patent and copyright models to subject matters for which they were not devised. Its prefabricated licensing provisions, inherently consistent with the public interest, overcome the high transaction costs that otherwise inhibit private transfers of unpatented, noncopyrightable applications of know-how to industry⁵⁷ while blurring the lines of demarcation that artificially separate intellectual property law from sister legal subcultures under current modes of analysis.⁵⁸ At the same time, the proposed liability rules need not produce any greater social costs than the trade secret regimes they emulate and rectify, and they should not, therefore, require new economic justification for their existence.⁵⁹ On the contrary, while doing no harm in themselves, they would gradually undo the cumulative anticompetitive effects flowing from the proliferation of exclusive property rights documented in this study and would ultimately elevate investment in unpatented, cutting-edge innovation well beyond current levels.⁶⁰

The primary purpose of this Article, however, is not to elaborate a blueprint for legislative action, but rather to change the way that scholars, legislators, and practitioners view the proliferation of hybrid legal regimes that currently challenge the integrity of the world's intellectual property system. Further studies resulting from this changed perspective will be needed before a consensus for legislative action emerges at either national or international levels, although it is heartening to note that several governments—and some leading scholars—have already moved in this direction. Meanwhile, a companion Article, entitled "A Manifesto

57. Under classical intellectual property law, the grant of exclusive property rights elicits regulatory action to defend free competition from abusive applications of those rights. However, this methodology becomes too costly and cumbersome when confronted with small-scale, incremental innovation that fails to meet the standards of eligibility for either patent or copyright protection, and tendencies to under- or overregulate the relevant licensing transactions recur periodically. See, e.g., Reichman, *Beyond the Historical Lines*, *supra* note 18, at 90–94, 113–16. The proposals developed in this Article specifically address the problem of protecting small-scale innovation that eludes the patent and copyright models. In so doing, they combine a different kind of entitlement with a built-in licensing framework that automatically takes the public interest into account. Cf. Calabresi & Melamed, *supra* note 29, at 1092.

58. See *supra* notes 1, 11–18 and accompanying text.

59. Cf. Copyright and Technological Change: Hearings Before the Subcomm. on Courts, Civil Liberties and the Administration of Justice of the House Comm. on the Judiciary, 98th Cong., 1st Sess. 65–67 (1983) (statement of David Lange, Prof. of Law, Duke Univ.) (proposing burdens of proof and adverse presumptions against any new proposals to extend copyright protection); Robert W. Kastenmeier & Michael J. Remington, *The Semiconductor Chip Protection Act of 1984: A Swamp or Firm Ground?*, 70 Minn. L. Rev. 417, 438–42 (1985) (discussing political test for imposing new intellectual property protection).

60. See *infra* note 506.

Concerning the Legal Protection of Computer Programs,"⁶¹ concretely examines a number of models that appear suitable for implementing the proposed new paradigm in the context of computer software, without necessarily disturbing rights already acquired under the patent and copyright laws. These two Articles, presented jointly to this Symposium, thus yield a common set of findings and a unified approach to the field. In this and other respects, they reinforce each other and are intended to be read together as integral parts of a larger whole.

I. DEVIATIONS FROM THE BIPOLAR STRUCTURE OF THE INTERNATIONAL INTELLECTUAL PROPERTY SYSTEM

The Great Conventions divide the international intellectual property system into two broad categories: industrial property and literary and artistic property. Several important positive and negative economic premises underlie the patent and copyright paradigms enshrined in these Conventions. In earlier work I have described this bipolar framework, its underlying assumptions, and some early deviant cases.⁶² After a brief review of the classical structure, I will focus on the proliferation of deviant cases and the challenge they pose to the international intellectual property system.

A. *The Dominant Intellectual Property Paradigms*

The Paris Convention for the Protection of Industrial Property (1883) and the Berne Convention for the Protection of Literary and Artistic Works (1886),⁶³ along with more recent international agreements,⁶⁴

61. Pamela Samuelson et al., A Manifesto Concerning the Legal Protection of Computer Programs, 94 Colum. L. Rev. 2308 (1994) [hereinafter *Manifesto*].

62. See Jerome H. Reichman, Legal Hybrids Between the Patent and Copyright Paradigms, in *Information Law Towards the 21st Century* 325 (Willem F. Korthals Altes et al. eds., 1992) [hereinafter Reichman, *Information Law*].

63. Paris Convention, supra note 4; Berne Convention, supra note 4.

64. The single most important treaty supplementing both the Paris and Berne Conventions is now GATT/TRIPs, supra note 7. Examples of other important treaties that supplement the protection of industrial property under the Paris Convention include the Budapest Treaty on the International Recognition of the Deposit of Microorganisms for the Purposes of Patent Procedure, Apr. 28, 1977, 32 U.S.T. 1241; Convention on the Grant of European Patents, Oct. 5, 1973, 13 I.L.M. 270 [hereinafter *European Patent Convention*]; Patent Cooperation Treaty, June 19, 1970, 28 U.S.T. 7645, 1160 U.N.T.S. 231; Agreement Concerning the International Registration of Marks, Apr. 14, 1891, as revised July 14, 1967, 828 U.N.T.S. 389; see also International Convention for the Protection of New Varieties of Plants, Dec. 2, 1961, 33 U.S.T. 2703, 815 U.N.T.S. 89 [hereinafter *UPOV*]; Agreement Concerning the International Registration of Industrial Designs and Models, Nov. 6, 1925, as revised June 2, 1934, T.S. No. 941, 47 Stat. 1789, T.S. No. 834, as revised at London, 1934, 205 L.N.T.S. 179, and amended at the Hague, Nov. 28, 1960 [hereinafter *Hague Agreement*]. On the copyright side of the ledger, the Universal Copyright Convention, Sept. 6, 1952, as revised July 24, 1971, 25 U.S.T. 1341, constructed a bridge between Berne and non-Berne countries that has diminished in importance since the United States adhered to Berne in 1989. See, e.g., Stephen M. Stewart, International

provide patent and copyright protection to industrial property and literary and artistic property, respectively.

Articles 1(1) and 1(2) of the Paris Convention, which established "a Union for the protection of industrial property,"⁶⁵ extend legal protection through the institutions of "patents, utility models, industrial designs, trademarks, service marks, trade names, indications of source . . . and the repression of unfair competition."⁶⁶ While some international minimum standards and the rule of national treatment apply to all these institutions,⁶⁷ the Paris Convention entrusted the protection of industrial creations primarily to "the various kinds of industrial patents recognized by the laws of the countries of the Union."⁶⁸ Complementing the protection of industrial property, Article 1 of the Berne Convention established "a Union for the protection of the rights of authors in their literary and artistic works."⁶⁹ Such works, categorized in Article 2(1), should receive automatic and mandatory protection in the domestic copyright laws of member states.⁷⁰ Whereas the patent paradigm and its variants grant a relatively short period of strong protection to inventions that meet their

Copyright and Neighbouring Rights 146-49 (2d ed. 1989). Of even greater importance, in contrast, are the treaties regulating so called rights allied to or neighboring on copyright law. See, e.g., Convention for the Protection of Producers of Phonograms Against Unauthorized Duplication of their Phonograms, Oct. 29, 1971, 25 U.S.T. 309, 866 U.N.T.S. 67 [hereinafter *Phonograms Convention*]; International Convention for the Protection of Performers, Producers of Phonograms and Broadcasting Organizations, Rome, Italy, Oct. 26, 1961, 496 U.N.T.S. 43 [hereinafter *Rome Convention*]. See generally World Intellectual Property Organization, Guide to the Rome Convention and to the Phonograms Convention 7-13 (1981) [hereinafter *Guide to the Rome Convention*]. The United States does not adhere to the Rome Convention.

65. Paris Convention, *supra* note 4, art. 1(1), 21 U.S.T. at 1630.

66. *Id.* art. 1(2), 21 U.S.T. at 163. See, e.g., 1 Ladas, *supra* note 5, at 1 ("[T]he division of intellectual property into literary or artistic and industrial property is very generally admitted.") Industrial property rights in this context embrace both legal monopolies, such as patents, utility models, and design rights, and the very different regimes concerned with trademarks, trade names, appellations of origin, and unfair competition in general. The assimilation of these diverse rights under a single rubric termed "industrial property" within a comprehensive, foundational treaty was largely a matter of convenience and historical accident. See, e.g., 1 & 2 Ladas, *supra* note 5, at 2-3, 967-70.

67. See Paris Convention, *supra* note 4, art. 2(1), 2(3), 21 U.S.T. at 1630; Bodenhausen, *supra* note 5, at 13-16; 1 Ladas, *supra* note 5, at 271-76. The principle of "national treatment" requires each member state to apply to nationals of other member states (and those treated as such nationals, see Paris Convention, *supra* note 4, art. 3, 21 U.S.T. at 1631) the same treatment as it gives to its own nationals, without being allowed to demand reciprocity. See Bodenhausen, *supra*, at 12.

68. Paris Convention, *supra* note 4, art. 1(4), 21 U.S.T. at 1630 (not defining patents and recognizing "patents of importation, patents of improvement, patents and certificates of addition, etc.").

69. Berne Convention, *supra* note 4, art. 1, S. Treaty Doc. No. 99-27, at 1.

70. See *id.* art. 2(1), 2(6), S. Treaty Doc. No. 99-27, at 1-2. Article 2(1), which derives from Article 4 of the 1886 text, states that the "expression 'literary and artistic works' shall include every production in the literary, scientific and artistic domain, whatever may be the mode or form of its expression," and then provides a detailed list of mandatory subject

strict substantive standards,⁷¹ most independently created literary and artistic works receive relatively soft protection against copying over a long period of time.⁷²

The line of demarcation between the Paris and Berne Conventions is critical, because it defines the outer limits of these fundamentally different types of protection. The line set out in the Paris Convention turns on the definition of "industrial property" in Article 1(3), which distinguishes between "all manufactured or natural products" of industrial and commercial activity "in the broadest sense" that are sold on the general products market and artistic "productions" governed by the Berne Convention. State practice further implements this line by normally excluding technical writings as such from eligibility as patentable subject matter while relegating technical and utilitarian writings to domestic and international copyright law. However, any residual lack of clarity pertaining to this line may give innovators an incentive to avoid strict patent requirements and to seek protection of industrial creations within copyright law,

matters. Cf. 17 U.S.C. § 102(a) (1988) (providing copyright protection for "original works of authorship" and listing eligible subject-matter categories).

71. See, e.g., 35 U.S.C. §§ 102-103 (1988) (requiring for patentability the stringent requirements of objective novelty, utility, and nonobviousness, which limits protection to exceptional or nonroutine advances beyond the prior art); *id.* § 154 (providing patent term of seventeen years); Dratler, *supra* note 15, § 103[1]; see also Friedrich-Karl Beier, *The Inventive Step in Its Historical Development*, 17 *Int'l Rev. Indus. Prop. & Copyright L.* 301, 309-23 (1986). Patent laws normally provide patentees with exclusive rights to make, to use, or to sell the patented inventions, and independent creation is not a valid defense. See, e.g., 35 U.S.C. § 271(a), (b) (1988); Dratler, *supra* note 15, § 103[1] (stating that the patent owner's "right to exclude is well-nigh absolute"). A weakness of the Paris Convention is that it mandates no international minimum standards concerning the subject matter of patentability, substantive prerequisites, duration, or scope of protection. However, the GATT/TRIPs, *supra* note 7, arts. 27-34, mandates the extension of patentability to virtually all fields of technology recognized in developed patent systems, prolongs patent protection to a uniform term of twenty years, and harmonizes eligibility requirements for all 124 member states. See generally Reichman, *TRIPs Component*, *supra* note 7, at 181-210.

72. See, e.g., 1 Paul Goldstein, *Copyright: Principles, Law and Practice* §§ 1.2-1.11 (1989 & Supp. 1994); Alain Strowel, *Droit D'Auteur et Copyright: Divergences et Convergences, Étude de Droit Comparé* 391-401, 468-81, 623-33, 644-51 (1993); *Guide to the Berne Convention*, *supra* note 5, at 12-17. State practice generally recognizes the principle that forbids discrimination on the basis of artistic merit. See, e.g., *Bleistein v. Donaldson Lithographing Co.*, 188 U.S. 239, 251 (1903); *Guide to the Berne Convention*, *supra* note 5, at 12-13; see also *Berne Convention*, *supra* note 4, arts. 2(1), 2(6), 5(2), 7(1), S. Treaty Doc. No. 99-27, at 1, 2, 4-5, 7-10 (requiring minimum term of life plus fifty years for individual authors of artistic works). Although the Berne Convention imposes no international minimum standard of eligibility and says nothing about scope of protection as such, the domestic copyright laws are remarkably similar in the following respects: only originality or subjective novelty is required, not objective novelty; only the form or expression is protected, not ideas; and proof of independent creation constitutes a valid defense to an action for infringement.

which applies without regard to artistic merit.⁷³ A blurred line also may cause incoherence in intellectual property policies and premises.⁷⁴ As this Article later demonstrates, the historical line between the two classical intellectual property regimes has become increasingly permeable in practice.

Important economic premises underlie the dominant legal 'paradigms'.⁷⁵ Patent law affirmatively grants inventors an absolute right of exclusion for a relatively short period if they satisfy the strict substantive prerequisites of novelty, utility, and above all, nonobviousness.⁷⁶ In addition to the positive economic benefits usually identified with this regime, patent law also implicitly regulates the general products market through at least four negative economic premises:

- 1) Unpatented innovations remain subject to price competition and may be imitated if disclosed;⁷⁷
- 2) Undisclosed unpatented innovations may be reverse engineered but not stolen;⁷⁸
- 3) Patented inventions are not infringed by nonequivalent innovation;⁷⁹

73. See Paris Convention, *supra* note 4, art. 1(3), 21 U.S.T. at 1630; *Baker v. Selden*, 101 U.S. 99, 102 (1879) (plaintiff unsuccessful in extending copyright in his book to an accounting method therein; "[t]hat is the province of letters—patent, not of copyright"); *supra* notes 70–72.

74. See, e.g., Marie-Angéle Pérot-Morel, *La Double Protection des Dessins et Modèles, in Le Droit D'Auteur Aujourd'hui* 117, 117–20 (Isabelle de Lamberterie ed., 1991) (case of commercial designs); J.H. Reichman, *Overlapping Proprietary Rights in University-Generated Research Products: The Case of Computer Programs*, 17 *Colum.-VLA J. L. & Arts* 51, 60–109 (1992) [hereinafter Reichman, *Overlapping Proprietary Rights*] (overlapping regimes for computer programs).

75. This discussion of negative economic premises derives from Reichman, *Information Law*, *supra* note 62, at 329–32.

76. See 35 U.S.C. §§ 101–103, 271 (1988); Harold C. Wegner, *Patent Harmonization* 77–134 (1993); *supra* note 71.

77. See, e.g., *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 151, 156–57 (1989) (state law that interferes with [public] enjoyment of "unpatented . . . conception which has been freely disclosed . . . impermissibly contravenes the ultimate goal of . . . federal patent policy"); *Compco Corp. v. Day-Brite Lighting, Inc.*, 376 U.S. 234, 237 (1964); *Sears Roebuck & Co. v. Stiffel Co.*, 376 U.S. 225 (1964); .

78. See *supra* notes 14–15, 20–21.

79. Under the doctrine of equivalents, second comers will not avoid infringement by making trivial variations if their product or process "performs substantially the same function [as the patented invention] in substantially the same way to obtain the same result." *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 608 (1950); see also Martin J. Adelman & Gary L. Francione, *The Doctrine of Equivalents in Patent Law: Questions that Pennwalt Did Not Answer*, 137 *U. Pa. L. Rev.* 673 (1989); Merges & Nelson, *supra* note 52, at 853–68 (stressing complex economics applicable to the determination of equivalents in specific cases).

- 4) Unfair competition law should not repress product imitation in the absence of confusion or deception.⁸⁰

Similarly, copyright laws (or "authors' rights" laws as they are known in most non-English-speaking countries⁸¹) affirmatively provide virtually all authors and artists who independently create their own works with a long period of relatively soft protection against copying.⁸² In addition to the positive economic benefits attributed to this regime, there are at least four negative economic premises implicit in the copyright protection of these works:

- 1) Noncopyrightable productions or components thereof remain subject to price competition and may be imitated if disclosed;⁸³
- 2) Nonprotectable ideas underlying independent creations may be used but not stolen [built-in reverse engineering];⁸⁴
- 3) Cultural policies are not applicable to the general products market;⁸⁵
- 4) Unfair competition laws should not limit users' rights in the absence of confusion or deception.⁸⁶

These negative premises of the classical regimes underscore that in principle, most unpatentable, noncopyrightable innovation should remain subject to competition in a free-market economy. While these conditions presumably benefit consumers by encouraging efficient production and innovation in the general products market, they inadequately protect today's innovators. The reverse engineering of industrial products by proper means was typically difficult in the nineteenth and early twentieth centuries, but new technological advances and products bearing know-how on their face are exposed to rapid duplication by competitors who expend only trivial efforts. Thus today's innovators often lack the natural lead time that enabled innovators in the past to secure a place in the market and to recoup their costs of research and development.

To overcome these difficulties, industrial innovators increasingly seek refuge in copyright law, notwithstanding the negative premises identified above. Unlike the patent regime, copyright law normally encourages third parties to use unprotected matter underlying protected expres-

80. See *Bonito Boats*, 489 U.S. at 158 ("The protection granted a particular design under the law of unfair competition is thus limited to the context where consumer confusion is likely to result."); *supra* note 16.

81. See, e.g., Strowel, *supra* note 72, at 17; see also Geller, *supra* note 2, at 13-29.

82. See, e.g., 17 U.S.C. §§ 102-103, 302, 501 (1988); *supra* note 71.

83. See 17 U.S.C. § 301 (1988); *supra* note 76.

84. See, e.g., 17 U.S.C. §§ 102 (b), 106, 107, (1988); *Feist Publications, Inc. v. Rural Tel. Serv. Co.*, 111 S. Ct. 1282, 1286-87 (1991); *Baker v. Selden*, 101 U.S. 99, 103 (1879).

85. See *Baker*, 101 U.S. at 102. See generally J.H. Reichman, Goldstein on Copyright Law: A Realist's Approach to a Technological Age, 43 Stan. L. Rev. 943, 947-48 (1991) [hereinafter Reichman, Realist's Approach] (demonstrating that states have subordinated efficiency goals to other cultural policy goals).

86. See *supra* notes 16 and 80.

sion. The overall objective is "to promote the progress of science," not merely the drive for economic efficiency.⁸⁷ As a result, copyright law promotes certain cultural policies, such as the long term of protection that benefits living artists and their heirs, that appear inconsistent with an efficient allocation of resources in the market for literary and artistic works as such. When industrial innovators succeed in gaining access to copyright protection by one means or another despite the negative premises defending the classical line of demarcation, the inefficiencies that copyright law tolerates in the specialized market for literary and artistic works are transferred to segments of the general products market. The resulting social costs cannot be reconciled with the standard economic justifications of the classical intellectual property system.

B. The Proliferation of Legal Hybrids: Selected Case Studies

In prior works I have represented graphically the two classical intellectual property regimes as meeting face to face at the historical line of demarcation cast in terms of the general products market.⁸⁸ I have shown that within each of the two compartments, even standard objects of protection receive different levels of protection against acts other than literal or nearly exact copying; this spectrum of protection may be described as a "thickness" or "thinness" syndrome.⁸⁹ The international intellectual property system provides virtually no minimum standards to constrain domestic judicial decisions in this regard.⁹⁰ Yet courts' determinations of the extent of protection for individual creations or certain subject matter greatly affect the overall social costs and benefits of these systems.⁹¹

87. U.S. Const. art. I, § 8, cl. 8; see L. Ray Patterson & Stanley W. Lindberg, *The Nature of Copyright—A Law of Users' Rights* 49 (1991).

88. See Reichman, *Information Law*, supra note 62, at 327–28.

89. See id. at 333–34.

90. This remains true even under GATT/TRIPs, supra note 7, which otherwise elevates the standards of protection generally. GATT/TRIPs, however, does introduce periodic trade policy review mechanisms as well as binding dispute resolution mechanisms that could lead to quasi-common law adjudications at the international level. Arguably, states could challenge or contest the scope of protection practices of other states in these forums. See, e.g., Paul E. Geller, *Intellectual Property in the World Marketplace: Impact of TRIPs Dispute Resolution*, 28 *International Lawyer* (forthcoming Winter 1994); Reichman, *TRIPs Component*, supra note 7, at 256–63; see also Reichman, *Beyond the Historical Lines*, supra note 18, at 108 (predicting future round of multilateral trade talks to establish international guidelines governing misuse of intellectual property rights).

91. Overprotection of intellectual property rights, for example, may result in increased social costs along with increased investment in protected forms of innovation, but underprotection may lower the social costs of specific unprotected innovations while decreasing incentives to invest in innovation generally. Cf. Merges & Nelson, supra note 52, at 908–916 (concluding that rapid technological achievement is encouraged by less broad patents); Paul Goldstein, *Derivative Rights and Derivative Works in Copyright*, 30 *J. Copyright Soc'y* 209 (1983) (protection of derivative works encourages investment in creative expression).

Patented inventions and traditional copyrighted works are conceptually located toward the outer ends of their respective spectrums, where the scope of protection is relatively "thick" (i.e. strong), while the deviant or marginal intellectual property models plausibly appear closer to the line of demarcation between industrial and artistic property, where the scope of protection is "thin" (i.e. weaker).⁹² On the industrial property side, the deviant protective regimes include utility model laws, registered design laws, plant variety protection laws, and unregistered design protection laws. Also included are recent unfair competition laws that restrain third parties from copying unpatented, noncopyrightable innovation. Logically included in this zone, but not analyzed in this study, are several other hybrid regimes, both existing and proposed, such as *sui generis* regimes protecting typeface designs,⁹³ regimes that issue inventors' certificates or that reward individual rationalization proposals (largely a heritage of the centrally planned economies),⁹⁴ and, arguably, proposed amendments to the United States patent law that would lower the standards of eligibility for certain discoveries in biogenetic engineering.

On the artistic property side of the line, the deviant regimes include *sui generis* laws protecting computer programs (now largely superseded); laws protecting integrated circuit designs on copyright-like principles; *sui generis* laws protecting miscellaneous items including databases and catalogues, applied art,⁹⁵ and engineering projects.⁹⁶ Also included are the European Union's experimental adaptation of copyright law to computer

92. An expanded discussion of the locus of deviant regimes in the nineteenth century is found in Reichman, *Information Law*, supra note 62, at 333-55.

93. See Vienna Agreement for the Protection of Type Faces and their International Deposit and Protocol Concerning the Term of Protection, June 12, 1973, 1974 Gr. Br. Misc. No. 27 (Cmd. 5754); Phillip W. Snyder, *Typeface Design After the Desktop Revolution: A New Case for Legal Protection*, 16 *Colum.-VLA J.L. & Arts* 97 (1991).

94. See, e.g., Stojan Pretnar, *Inventor's Certificates, Rationalization Proposals and Discoveries*, in 14 *International Encyclopedia of Comparative Law: Copyright and Industrial Property*, 6-3 to 6-111 (Eugene Ulmer ed., 1983).

95. See Berne Convention, supra note 4, arts. 2(7), 7(4); supra note 430. The treatment of designs in both marginal zones reflects the diversity of practice, as well as the fact that designs combine aesthetic and functional features. This phenomena loses much of its anomalous character the moment that one disregards the classical line of demarcation itself.

96. Engineering projects, though functional in character, are typically excluded from patent law as mental processes whose novelty does not reside in physical structures or extension but rather in concepts conveyed by the arrangement of words or other symbols. See, e.g., 2 Tito Ravá, *Diritto Industriale—Invenzioni e Modelli Industriali* 54-55 (Mario Fabiani & Paolo Spada eds., 1988) [hereinafter *Fabiani*] (comparing engineering projects to computer programs in this respect, and noting *sui generis* protection of engineering projects in special Italian law related to copyrights); 1 Peter D. Rosenberg, *Patent Law Fundamentals*, § 6.02[3] (2d ed. 1994) (technical writings convey novelty of concepts rather than of physical structure and are therefore not patentable under United States law). Moreover, few, if any, engineering project designs would ever satisfy the nonobviousness criterion of patent law, which requires a qualitative step beyond the prior art. Cf. 1 Rosenberg, supra, § 6.02; supra note 71. For this and other reasons, engineering

programs, as well as certain aberrational experiments in the domestic copyright laws, such as full copyright protection of functional designs in the United Kingdom (now superseded); full copyright protection of mostly nonfunctional appearance designs in France; and modified forms of copyright protection for certain borderline functional works, such as measures concerning technical drawings and engineering projects in Germany and the United States. Logically included in this zone but not analyzed in depth are the more traditional rights, related to or "neighboring" on copyright law, which protect performers, broadcasting organizations, and the producers of sound recordings, and turn out to be less deviant than may appear on the surface.

1. *Selected Marginal Cases in the Spectrum of Industrial and Quasi-Industrial Property.* — The subsections that follow describe both old and new deviations from the classical patent and copyright paradigms. To some extent, the order of presentation attempts to express a movement from more patent-like to more copyright-like forms of industrial property protection. However, such distinctions are matters of degree on which no two observers would necessarily agree.⁹⁷ The diversity of permutations and combinations reflects a fundamental lack of coherence, aggravated by special interest pressures, that permeates the zone in which hybrid regimes of exclusive intellectual property rights thrive and multiply. Hybrids that have been described in earlier work will receive brief treatment,⁹⁸ while emerging deviant cases will receive more detailed attention.

a. *Utility Models.* — Utility model laws probably antedate the international intellectual property system itself,⁹⁹ and their propensity to reward minor local inventions at early stages of the industrial revolution in such countries as Germany, Italy, and Japan¹⁰⁰ helps to account for their grow-

projects attract protection either as functional works in copyright law or under sui generis regimes.

97. Logically, for example, one could examine plant protection regimes before industrial design regimes, because the latter overlap the border with copyrightable works of applied art. See *infra* notes 122–124 and accompanying text. The arbitrariness of these distinctions accurately reflects both the instability of specific regimes and the incoherence and public-choice pressures which discredit the hybrid regimes as a whole. See *infra* text accompanying notes 386–398. Further complications arise because practicing lawyers are wedded both conceptually and financially to specific legal cultures. Cf. William Wallace, *Design Protection in the United Kingdom*, reprinted in *Design Protection*, 39, 39–40 (Herman Cohen Jehoram ed., 1976) [hereinafter *Design Protection*] (stressing patent lawyers' vested interests in patent approach to industrial designs).

98. See Reichman, *Information Law*, *supra* note 62, at 335–41.

99. The first utility model law may have been passed as early as 1843 in the United Kingdom, some forty years before the Paris Convention. It was repealed in 1883. See, e.g., 2 Ladas, *supra* note 5, at 949.

100. The prototypical regime was the German Utility Model Act of June 1, 1891, which remained largely unchanged until the Bundesgesetzblatt Act to Amend the Utility Model Act, 1986 I, 1446 (Ger.) reprinted as amended in 6 German Industrial Property, Copyright and Antitrust Laws 72 (F.-K. Beier et al. eds., 2d rev. & enlarged ed. 1989) (IIC

ing popularity in developing countries today.¹⁰¹ The purpose of early utility model laws was to protect functional improvements in the three-dimensional shapes of handtools and similar implements which neither patent¹⁰² nor trade secret law¹⁰³ effectively protected. These tools could not be protected under ornamental design laws, which traditionally excluded functionally determined designs.¹⁰⁴

Utility model laws typically protected the external product configuration or part thereof that enhanced the technical proficiency of the tool or

Studies: Studies in Industrial Property Utility Model and Copyright Law). The German Utility Model Act was further amended in 1990. Italian lawmakers, though long familiar with ornamental design laws, did not enact a utility model law until 1940. See Decree No. 1411 on Models and Designs of Aug. 25, 1940 as amended May 23, 1977, June 27, 1979, & Feb. 14, 1987, reprinted in *Codice Della Proprietà Industriale e Del Diritto D'Autore* (Mario Fabiani ed., 1990) (Italy) [hereinafter Italian Design and Utility Model Law]. In Japan, which acceded to the Paris Convention in 1899, there was concern that foreign patents would predominate and that incentives were lacking for domestic inventions of minor technical importance. Viewing the German law as the source of a solution, the Japanese government enacted its own utility model law in 1905, and it has been amended several times since. See Utility Model Law, Law No. 123 of April 13, 1959 as amended through Law No. 30 of 1990, reprinted in *Japanese Laws Relating to Industrial Property* 79 (AIPPI Japan 1992) [hereinafter Japanese Utility Model Law of 1959]. The Japanese Utility Model Law was substantially revised in 1993 and now resembles the German Utility Model Act of 1990. Until 1993, however, the Japanese version deviated from the German prototype in several important respects. See Terno Doi, *The Intellectual Property Law of Japan* 68–69 (1980); *infra* note 102.

101. See, e.g., Shoji Matsui, *The Transfer of Technology to Developing Countries: Some Proposals to Solve Current Problems*, 59 *J. Pat. Off. Soc'y* 612, 620–23 (1977); Chen Ruifang, *The Utility Model System and Its Benefits for China—Some Deliberations Based on German and Japanese Legislation*, 14 *Int'l Rev. Indus. Prop. & Copyright L.* 493, 501–07 (1983); see also William Lesser, *An Overview of Intellectual Property Systems*, in *Strengthening Protection of Intellectual Property in Developing Countries: A Survey of the Literature* 5, 7–8 (Wolfgang E. Siebeck et al. eds., World Bank Discussion Papers No. 112 1990). For summaries of the relevant laws, see Anne M. Greene, *Designs and Utility Models Throughout the World* (1990 Update by Alan J. Jacobs).

102. See Reichman, *Information Law*, *supra* note 62, at 335; German Utility Model Act, reprinted in *German Industrial Property, Copyright and Antitrust Laws*, *supra* note 100, § 1(1); Italian Design and Utility Model Law, *supra* note 100, art. 2. The Japanese Utility Model Law of 1959 as amended through 1990, *supra* note 100, art. 1, although ostensibly similar in scope to the German law, appears to have behaved as a “petty patent” regime from the start and not merely as a law to protect innovative working tools and useful articles. See *infra* note 115.

103. See, e.g., 2 Ladas, *supra* note 5, at 949–50; E. Häusser, *Utility Models: The Experience of the Federal Republic of Germany*, 26 *Indus. Prop.* 314, 316 (1987); Fabiani, *supra* note 96, at 216–19, 222 (stressing application of utility model law to products already known but susceptible to improvements of shape or structure).

104. See, e.g., Reichman, *The United States Experience*, *supra* note 44, at 37. But see *id.* at 38–39 (discussing the United Kingdom’s unregistered design right, enacted in 1988, which “confer[s] copyright-like protection on both functional and aesthetic designs”).

implement;¹⁰⁵ they did not protect the underlying idea or process.¹⁰⁶ Small- and medium-sized firms were particularly interested in utility model laws, despite the eventual availability of international protection under the Paris Convention.¹⁰⁷ However, in 1990 Germany enacted reforms that permitted protection of electronic circuit designs as well as "chemical substances, foodstuffs, drugs [and] immovables."¹⁰⁸ This protection was no longer conditioned on the element of a three-dimensional shape.

Eligible tool designs obtained almost immediate patent-like protection¹⁰⁹ for a relatively short period of time (which now averages six to ten

105. See, e.g., Frederick-Karl Beier, Introduction, in *German Industrial Property, Copyright and Antitrust Laws*, supra note 100, at 9–10 (stressing effort "to close a gap between the protection of registered designs (Geschmacksmuster) protecting the outer appearance but not the technical function of an article, and the long-term, expensive and not easily obtainable patent protection for more important inventions"); see also Häusser, supra note 103, at 314.

106. See François Perret, *L'Autonomie du Régime de Protection des Dessin et Modèles* 147–48 (1974) (stating that utility model laws "aim at a creation of form in the sense that the inventive activity is expressed in the external shape of a useful object and not in the technical idea that governed its inception") (trans.). Over time, nevertheless, German case law increasingly tended to view the object of protection as the technical idea that becomes expressed by means of the three-dimensional form, and this is the sense that Italian courts often seem to give it, despite differences of opinion among scholars. See, e.g., Perret, supra, at 188–98, 225–30 (criticizing this evolution); Marie-Angéle Pérot-Morel, *L'ambiguïté du Concept de Modèle D'Utilité*, in *Studi in Onore di Remo Franceschelli: Sui Brevetti di Invenzione e sui Marchi* 425, 429–31 (1983). This evolution, however, leads naturally to the protection of small inventions generally, without emphasis on product configuration, which is where even the German law ends up by the late twentieth century. See infra text accompanying notes 108, 115, and 116.

Meanwhile, the insistence of the German law that a utility model application should convey a specific technical teaching through a three-dimensional form excluded broad categories of subject matter from eligibility: e.g., processes, chemical substances, foodstuffs and drugs, substances without a defined shape, immovables (such as buildings or bridges), and electronic circuit designs. See, e.g., E. Häusser, supra note 103, at 315; H. Geoffrey Lynfield, *German Utility Models*, 47 *J. Pat. Off. Soc'y* 374, 376–77 (1965). Italian, but not Japanese, law was similar in this respect in that Japanese law did not insist on an improvement in shape. See, e.g., Fabiani, supra note 96, at 220–21; Doi, supra note 99, at 70.

107. See Roland Leisegang, *German Utility Models After the 1990 Reform Act*, 20 *A.I.P.L.A. Q.J.* 1, 2 (1992).

108. See supra note 100; Leisegang, supra note 107, at 3. Resistance to admitting electronic circuit designs to the Japanese law (always rather anomalous in practice) apparently turned on the requirement of a device. See Sadanao Amemiya, *Intellectual Property Protection*, in *Doing Business in Japan*, § 6.06[2] (Z. Kitagawa ed., 1994).

109. See, e.g., Fabiani, supra note 96, at 213, 216–22; Leisegang, supra note 107, at 2–4. Because a utility model application takes effect almost immediately in German law (average processing time is three to four months), an innovator may wish to file both a utility model application and a patent application in order to rely on the former while the latter is pending. See, e.g., Häusser, supra note 103, at 316–17.

years)¹¹⁰ without, for the most part, substantive examination.¹¹¹ In practice, courts generally apply a weaker standard than nonobviousness, despite the similarity between eligibility criteria in patent and utility model laws. Germany's recent reform codifies this weaker requirement.¹¹² Utility model laws thus deviate significantly from the patent norm, which traditionally requires a true inventive step as a prerequisite to protection.

Utility model laws differ from traditional patent law in several other important ways. The scope of protection available under utility model laws is narrower than traditional patent law provides.¹¹³ Moreover, judicial evaluation of the eligibility requirements in the course of cancellation or infringement proceedings tends to emphasize such secondary factors as commercial success and copying, which smacks of unfair competition law.

Although the utility model laws have always required a qualitatively significant level of innovation to qualify for protection, their primary

110. See, e.g., Beier, *supra* note 105, at 9 (noting extension of duration of protection in the 1986 amendments from a maximum of six years to a maximum of eight years); Fabiani, *supra* note 96, at 255 (noting that, since the 1977 amendments, utility models obtain ten years of protection from the date of application). The first German Utility Model Law apparently gave only a three-year term of protection.

111. See Beier, *supra* note 105, at 10; Häusser, *supra* note 103, at 316 (Germany). Although Italy provides an examination process which appears similar to the one for patents, see Fabiani, *supra* note 96, at 253-55, it must be remembered that patent examination in Italy is fairly superficial and resembles a registration system more than an examination system. Japanese law required a full examination until the most recent amendments of 1993, see Doi, *supra* note 99, at 68-69, 77, and this deviated from the German prototype.

112. See, e.g., German Industrial Property, Copyright and Antitrust Laws, *supra* note 100, at 72 n.1 (translating "[i]nventive step" in German Utility Model Act, *supra* note 100, § 1(1), for the German "erfinderischer Schritt . . . used here to designate a lower level of nonobviousness than that for which the European Patent Convention and the German Patent Act uses the term 'erfinderische Tätigkeit'"); Leisegang, *supra* note 107, at 2-5; Hermann Isay, *Gebrauchsmuster, in Patents and Gebrauchsmuster in International Law* 268, 289 (Emerson Stringham ed., 1935) (standard of invention is "milder, but not entirely eliminated"). Verbal formulations of the eligibility standard remain vague with an emphasis on a tangible, functional improvement over the prior art, and application of the standard appears to vary with the subject matter, depending on how crowded the field appears to the courts. See, e.g., Lynfield, *supra* note 106, at 382. Reportedly, the standard is further relaxed by evaluating the level of inventive activity through the eyes of the reasonable person rather than a routine engineer skilled in the art, as in patent law. See, e.g., Rudolf Nirk, *Gewerblicher Rechtsschutz* 328-29 (1981); Robert P. Sabath, Note, *Petty Patents in the Federal Republic of Germany: A Solution to the Problem of Computer Software Protection?*, 8 Sw. U. L. Rev. 888, 890 n.16; see also Fabiani, *supra* note 96, at 229-30 (1976); Doi, *supra* note 99, at 69-70.

113. See 2 Ladas, *supra* note 5, at 955; see also Fabiani, *supra* note 100, at 255; Patents and Gebrauchsmuster in International Law, *supra* note 112, at 252 (contrasting the breadth of patent protection with the narrowness of utility model patents, which are limited to the new shape, spatially embodied, and not the power of nature embodied; and stressing that protection is for "the little inventions of daily life . . . expressed in new useful spatial form" (quoting Otto Cantor, *Gesetz betreffend den Schutz von Gebrauchsmustern* von 1 juni 1891 (1911))).

function was arguably to provide artificial lead time to compensate for the lack of natural lead time in trade secret law. Utility model laws were thus true precursors of the many hybrid legal solutions developed for new technologies and therefore contain valuable lessons for those seeking to resolve the current impasse. In particular, they represent a form of industrial property protection that did not unduly discourage competitors from building on an innovator's contributions and that usually permitted an improver to capture the economic value of his improvement.

While the utility model laws appeared to impose a stricter discipline than that of the *sui generis* design laws (owing to the functional nature of tool designs), they disguised the extent to which protection of utility models undermined the economic rationale of a mature patent system. The line of demarcation between these two regimes still remains uncertain.¹¹⁴ Over time, moreover, utility laws degenerated into longer and stronger petty patent regimes devoted to small inventions generally, and they are no longer strictly tied to novel, three-dimensional shapes of tools and everyday implements.¹¹⁵ This evolution institutionalizes the economic contradictions inherent in the establishment of a patent-like regime that accepts less than nonobvious innovation.¹¹⁶

Viewed only in its historical context, a decision to allow innovative tool designs to escape free competition, but not a host of other innovative creations that seem no less deserving of protection, appears hard to justify.¹¹⁷ Viewed within a broader context of other deviant regimes, utility model laws fail to recognize the growing need to protect tangible embodiments of know-how that do not qualify for patent or trade secret protection. Thus these early efforts to circumvent the strict standards of patent law reflect a more general problem that has become increasingly pressing in the last two decades.

b. *Industrial Designs*. — Small- and medium-sized firms have long tried to compensate for a lack of market power by improving the appearance and functional efficiency of their products through new and often

114. See, e.g., Fabiani, *supra* note 96, 219–27; Häusser, *supra* note 103, at 315; Giuseppe Sena, *I Diritti Sulle Invenzioni e Sui Modelli Industriali* 530–35 (3d ed. 1990).

115. See, e.g., Fabiani, *supra* note 96, at 216–19, 222–23; Häusser, *supra* note 103, at 314 (describing utility model protection as “a ‘petty patent,’ ”); *supra* notes 106–108 and accompanying text. The Japanese law was apparently conceived as a petty patent law from the start, which may account for both the retention of the examination requirement until recently and its longer duration.

116. Cf. Perret, *supra* note 106, at 188–233 (criticizing unsustainable distinction between innovative form and innovative technical idea); Pérot-Morel, *supra* note 106.

117. Empirically, however, countries without utility model laws experience pressures on the patent law to protect minor technical inventions. See, e.g., Pérot-Morel, *supra* note 106, at 425–29 (case of France); Stedman, *supra* note 13, at 28–29 (observing that U.S. patent examiners tended routinely to admit small inventions, which federal courts routinely rejected). From this angle, the antipatent attitude of the Supreme Court throughout most of the twentieth century may be viewed, in part, as expressing resistance to utility models in disguise.

costly engineering techniques, while large firms now devote substantial funds to developing distinctive and technically superior product designs that can withstand competition from newly industrialized countries in the international marketplace.¹¹⁸ Once these ornamental designs of useful articles (or "appearance designs," as they are known today) become embodied in products sold on the open market, however, they forfeit any trade secret protection that the manufacturer previously enjoyed. Any third party who obtains possession of the tangible physical product can swiftly reproduce the intangible commercial design it embodies without incurring any appreciable costs of reverse engineering.

(i) *Registered Design Protection Laws.* — To counteract the disincentives thought to flow from this raw state of affairs, some governments enacted early laws to protect certain ornamental designs of useful articles.¹¹⁹ By the middle of the nineteenth century, the patentability of ornamental designs was accepted in principle, and the United States Design Patent Law of 1842 still subjects such designs to all the formal and substantive prerequisites of the full patent paradigm.¹²⁰ In practice, however, the patent process has proved too rigid, slow, and costly for the fast-moving, short-lived products of mass consumption, and too strict in excluding the bulk of all commercial designs on grounds of obviousness.¹²¹

The resulting state of chronic underprotection eventually led some Berne Union countries to protect industrial designs in copyright law.¹²²

118. See, e.g., Commission of the European Communities, Explanatory Memorandum to the Proposal for a European Parliament and Council Regulation on the Community Design (COM (93) 342 final—COD-463) 1, 3-4 (1993) [hereinafter EC Explanatory Memorandum on Designs]; Christopher Lorenz, *The Design Dimension—Product Strategy and the Challenge of Global Marketing* 10-27, 145-49 (1986); *Product Design and Technological Innovation* (Robin Roy & David Wield eds., 1986); D.O. Ughanwa & M.J. Baker, *The Role of Design in International Competitiveness* 243-344 (1989).

119. See 2 Ladas, *supra* note 5, at 829 (citing a British design protection act from 1787).

120. See Act of Aug. 29, 1842, ch. 263, § 2, 5 Stat. 543 (1842) (codified as amended at 35 U.S.C. §§ 171-173, 289 (1988)); see also Thomas B. Hudson, *A Brief History of the Development of Design Patent Protection in the United States*, 30 J. Pat. Off. Soc'y 380, 381-83 (1948). Other countries still adhering to a fairly strict patent model include the United Kingdom, Canada, Ireland, and Japan. See Reichman, *The United States Experience*, *supra* note 44, at 8 n.3; Yoichiro Yamaguchi, *Japanese Design Law and Practice*, 19 U. Balt. L. Rev. 417, 417-24 (1989/1990). However, the United Kingdom also provides copyright-like protection for most industrial designs, and Japan's design law is currently undergoing a thorough reevaluation; see Yamaguchi, *supra*, at 429-30.

121. See 35 U.S.C. §§ 131, 171 (1988) (requiring examination of design applications). In the United States, until recently, the requirement of nonfunctionality killed almost as many candidates for design patent protection as did nonobviousness. See Nimetz, *Design Protection*, 15 Copyright L. Symp. (ASCAP) 79, 125-28, 113-21 (1967). For the exclusionary effect of the nonobviousness criterion in U.S. law, see 17 U.S.C. §§ 103, 171 (1988); Reichman, *The United States Experience*, *supra* note 44, at 24-25, 53-56.

122. See, e.g., J.H. Reichman, *Design Protection After the Copyright Act of 1976: A Comparative View of the Emerging Interim Models*, 31 J. Copyright Soc'y 267, 283-97

As I have previously noted,¹²³ however, this subverted the key negative economic premises of the world intellectual property framework by permitting the products in which these designs are embodied to compete in both the specialized market for artistic works and the general products market. This "two-market conundrum" facilitates extension of the generous modalities of copyright law into the general products market for which it was not designed. For this reason, most industrialized countries, including Germany, Italy, Japan, and the United States, strictly limit copyright protection of three-dimensional appearance designs.¹²⁴ Only France and to some extent, the Benelux countries, still afford full copyright protection to designs not adequately covered by their *sui generis* design laws.¹²⁵

The failure of both the patent and copyright approaches then led to renewed interest in *sui generis* design protection laws built on modified patent principles. After the Paris Convention was amended in 1958 to require some protection for industrial designs,¹²⁶ reformed versions of these laws were widely promulgated.¹²⁷ These *sui generis* design laws normally protect two-dimensional designs or three-dimensional models that enhance the appearance of industrial products by means of form or a particular combination of lines, colors, or appealing features.¹²⁸ Generally, such laws require registration and deposit, objective novelty,¹²⁹ and

(1983) [hereinafter Reichman, *Designs After 1976*] (detailing expansion of Belgian copyright law to accommodate ornamental designs prior to enactment of special design laws in 1975); J.H. Reichman, *Design Protection in Domestic and Foreign Copyright Law: From the Berne Revision of 1948 to the Copyright Act of 1976*, 1983 *Duke L.J.* 1143, 1153-58 [hereinafter Reichman, *Designs Before 1976*] (explaining the "unity of art" doctrine in France).

123. See Reichman, *Information Law*, *supra* note 62, at 337.

124. See, e.g., 17 U.S.C. § 101 (1988) (neo-Italian separability criterion incorporated into definition of pictorial, graphic and sculptural works); *Brandir Int'l Inc. v. Cascade Pacific Lumber Co.*, 834 F.2d 1142, 1145 (2d Cir. 1987); *Carol Barnhart Inc. v. Economy Cover Corp.*, 773 F.2d 411, 418 (2d Cir. 1985); F. Benussi, *Protection of Industrial Designs in Italian and Comparative European Law*, 25 *Indus. Prop.* 61, 62-66 (1986); Wladimir Duchemin, *General Report—The Protection of Designs and Models*, in *ALAI, La Protection des Dessins et Modèles* 47-79 (1985); Herman Cohen Jehoram, *Protection of Industrial Design Between Copyright and Design Laws: A Comparative Study*, in *ALAI, Congress of the Aegean Sea* 77-104 (1983) [hereinafter *ALAI 1983*].

125. See *supra* note 122.

126. See Paris Convention, *supra* note 4, art. 5 *quinquies*, 21 U.S.T. at 1754.

127. See Copyright, Designs and Patents Act, 1988, ch. 48, §§ 265-73 (Engl.); Greene, *supra* note 101 (individual countries); Reichman, *Designs Before 1976*, at 1159-67 (Benelux countries, Germany, Italy, and the Nordic countries).

128. See, e.g., Italian Design and Utility Model Law, *supra* note 100, art. 5; Beier, *supra* note 105, at 3, 11.

129. See, e.g., Duchemin, *supra* note 124, at 63-64 ("objective and absolute novelty, implying the absence of precedents, with no limitation of time or space" required in most countries, although Benelux countries and Germany now place temporal and geographic limits on the prior art that may be considered).

some degree of qualitative innovation,¹³⁰ but not necessarily a full examination of the prior art.¹³¹ Functionally determined designs are excluded in principle, although not always in practice.¹³² The exclusive rights provided are nominally those of patent law,¹³³ and the term of duration, initially rather short, has been lengthened to ten or fifteen years in most countries.¹³⁴

To understand why these reforms failed to meet expectations, one should recall that the oldest *sui generis* design laws, such as those of Germany and France,¹³⁵ were adopted at a time when "art" was still "applied to industry," form and function were not yet routinely integrated, and the line between artisanry and products reproduced in series had yet to be probed.¹³⁶ Once the design industries began to integrate form and function even in products sold on the market for mass-produced goods, however, protecting "aesthetic" features in special design laws increasingly looked like a pretext for enabling manufacturers to circumvent the strict standards of patent law.¹³⁷ As a result, courts and legislatures have endowed even the more recent *sui generis* design laws with the relatively stringent formal and substantive prerequisites that limit their effectiveness. Apart from the cumbersome and expensive requirements of registration and deposit (and sometimes even an examination of the prior art), which small firms find burdensome,¹³⁸ the novelty requirement usu-

130. See, e.g., Duchemin, *supra* note 124, at 63-64; see *infra* note 141 and accompanying text.

131. See, e.g., Duchemin, *supra* note 124, at 65-67. But cf. Fabiani, *supra* note 96, at 253-54 (opposition procedure permitted in Italy and the Nordic countries).

132. See, e.g., Reichman, *The United States Experience*, *supra* note 44, at 22 n.86; *infra* note 140.

133. Hence, with the exception of the Federal Republic of Germany, independent creation does not usually constitute a valid defense. See, e.g., Duchemin, *supra* note 124, at 35; Cohen Jehoram, *supra* note 124, at 81; Beier, *supra* note 105, at 12.

134. See, e.g., Duchemin, *supra* note 124, at 35, 69; Fabiani, *supra* note 96, at 255 (Italy, 15 years); Beier, *supra* note 105, at 11 (Germany, 20 years).

135. See Act Concerning Copyright in Designs (German Design Act) of January 11, 1876, as amended on Dec. 18, 1986, in *German Industrial Property, Copyright and Antitrust Laws*, *supra* note 100, at 82; Law on Designs and Models (French Design Statute) of July 14, 1909, as amended April 24, 1980, Translated in UNESCO & BIRPI, *Design Laws and Treatises of the World*, France, item 1.

136. See generally Perret, *supra* note 106, at 9-17. To the extent that nineteenth-century legislators assumed beauty and utility to possess separate, antithetical natures, see, e.g., *id.* at 11-13, 26-29, legal protection of ornamental designs did not appear necessarily to undermine the economic rationales of either patents or copyrights, and the *sui generis* laws were indulgently administered. See, e.g., Act Concerning Copyright in Designs, in *German Industrial Property, Copyright and Antitrust Laws*, *supra* note 100, at 82, which still protects against copying only. However, the requirement of originality in the German law, initially akin to that of copyright law, has judicially evolved over the years to become a variant of the nonobviousness test. See, e.g., Beier, *supra* note 105, at 11.

137. Cf. Nimetz, *supra* note 121, at 83, 122-25.

138. See, e.g., Michael Loschelder, *The New German Model and Design Act*, 19 *Int'l Rev. Indus. Prop. & Copyright L.* 622, 637-38 (1988).

ally applies to antecedent designs of the applicant in prior use, and no grace period is generally available in which to test-market a number of designs prior to registration.¹³⁹ Judicial application of the functionality bar has been zealous in most countries, yet so indulgent in a few countries, especially the Nordic countries, as to blur the line between an ornamental design law and a utility model law.¹⁴⁰ In either case, the incidence of functional considerations on overall design solutions has inclined courts everywhere to elevate the standards of qualitative originality, often to the point where they fall just short of the nonobviousness test in patent law.¹⁴¹ Despite the trouble and expense of qualifying for exclusive rights, successful applicants are rarely protected against more than slavish imitation.¹⁴²

The twice-excluded designs are thus left at the mercy of free-riding imitators unless their originators supplicate at the portals of unfair competition law or attempt to reenter copyright law through the back door. To the extent that some courts respond by stretching unfair competition laws sounding in the confusion rationale to cover design piracy or misappropriation, as the United States federal courts of appeals have done since the 1980s,¹⁴³ they undermine the policies behind the design laws

139. See Reichman, *The United States Experience*, supra note 44, 21–23 (comparing strict novelty standard in foreign design law to flexible novelty standard in the U.S.); cf. Loschelder, supra note 138, at 629 (noting German law now provides six-month grace period).

140. Compare Christine Fellner, *United Kingdom*, in *ALAI 1983*, supra note 124, at 142 (strict standard of nonfunctionality in United Kingdom) with Marianne Levin, *Nordic Countries*, in *ALAI 1983*, supra note 124, 135–37 (tendency of Nordic laws to absorb highly functional designs). The other design laws fall in between these extremes. See Reichman, *The United States Experience*, supra note 44, at 22 n.86.

141. See Beier, supra note 105, at 11 (Federal Republic of Germany); Fabiani, supra note 96, at 240–43 (Italy); Fellner, supra note 140, at 142 (U.K. pre-1989); supra note 136. Even in countries that have no statutory originality requirement, such as the Nordic countries and the Benelux countries, courts may demand what amounts to a *de facto* qualitative standard. See, e.g., Duchemin, supra note 124, at 63–64; Marianne Levin, *Recent Developments in Nordic Design Protection*, 19 *Int'l Rev. Indus. Prop. & Copyright L.* 606, 608 (1988).

142. See, e.g., supra note 136 (German design law); Fabiani, supra note 96, at 255–56 (narrow scope of protection is necessary to avoid protecting style trends of which the protected design is a part); Marie Angéle Pérot-Morel, *Les Principes de Protection des Dessins et modèles dans les Pays du Marché Commun* 19 (1968).

At their worst, these laws tend either to exclude the bulk of the designs they are nominally supposed to protect or to provide weak protection against slavish imitation of a kind that some countries' unfair competition laws make available at much lower cost. At their best, the special design laws are of primary interest to big firms prepared to spend large amounts on research and development, advertising, and the legal fees necessary to secure systematic design protection.

143. See generally Reichman, *The United States Experience*, supra note 44, at 98–123 (citing authorities); J.H. Reichman, *Past and Current Trends in the Evolution of Design Protection Law—A Comment*, 4 *Fordham Intell. Prop. Media & Ent. L.J.* 387, 392–97 (1993) [hereinafter Reichman, *Evolution*] (appearance trade dress from Bonito Boats v. Thunder Craft Boats, 489 U.S. 141 (1989) to *Two Pesos v. Taco Cabana*, 112 S.Ct. 2753

and trigger new forms of overprotection that are still more anticompetitive than the exclusive rights of copyright law. To the extent that other courts sooner or later admit some particularly creative designs to copyright law, the line of demarcation between authors' rights and design rights is blurred, and succeeding courts are tempted to justify preferential treatment for particular designs in terms of Byzantine rationalizations that violate the rule of nondiscrimination on the basis of merit.

Thus, the two-hundred-year quest for a regime of exclusive property rights to solve the puzzle reveals only a recurring, cyclical pattern that starts with an initial condition of underprotection stemming from the assimilation of ornamental designs to the full patent paradigm and the resulting pressures on copyright law. This cyclical pattern occurs as follows:

The tendency of industrial property law to breed . . . underprotection [that is, in *sui generis* laws built on modified patent principles] or overprotection [that is, in unfair competition laws sounding in the misappropriation rationale] then fosters renewed pressures for the regulation of industrial art within the framework of the laws governing literary and artistic property.¹⁴⁴

In other words, chronic underprotection in industrial property laws leads to chronic overprotection in artistic property law, which in turn inspires further reactive reforms of industrial property law tending to reinstate levels of underprotection that will foster renewed appeals to copyright law.

(ii) *Unregistered Design Rights*. — Dissatisfaction with design protection laws enacted between 1958 and 1975 has led to the recent adoption of more radical solutions. For example, the long-discredited practice of

(1992)); see also J.H. Reichman, *Design Protection and the Legislative Agenda*, 55 *Law & Contemp. Probs.* 281, 284–90 (1992) [hereinafter Reichman, *Designs and Legislative Agenda*].

144. Reichman, *Designs and Legislative Agenda*, supra note 143, at 287. The cyclical pattern as a whole has been summarized as follows:

Traditionally the right to copyright protection is premised on a claim that certain industrial designs are entitled to legal recognition as art in the historical sense. The [adverse] economic repercussions of such recognition flow principally from the industrial character of the material support in which ornamental designs are embodied. The incidence of these repercussions upon any given system varies with the extent to which the claim to recognition as art is itself given effect. As copyright protection for designs of useful articles expands, the . . . [anticompetitive] effects of this expansion on the general products market induce countervailing pressures to reduce the scope of protection acquired in the name of art. As protection in copyright law correspondingly contracts, pressure for recognition of industrial art as a legally protectible form of industrial property normally increases. The tendency of industrial property law to breed still further instances of underprotection [that is, in *sui generis* laws built on modified patent principles] or overprotection [that is, in unfair competition laws sounding in the misappropriation rationale] then fosters renewed pressures for the regulation of industrial art within the framework of the laws governing literary and artistic property.

Id.

protecting appearance designs in copyright law, which survived only in France, appears to have been judicially revived in the Benelux countries in the late 1980s.¹⁴⁵ In the United States, where Congress failed to enact an innovative *sui generis* design law built on modified copyright principles in 1975,¹⁴⁶ the federal appellate courts have treated product configurations as unregistered "appearance trade dress" protectible under the Lanham Act § 43(a) for an indefinite period of time.¹⁴⁷ Most radical of all were developments in the United Kingdom, where copyright-like protection of unregistered functional or aesthetic designs for a fifteen-year period has become available since 1989. The United Kingdom's unregistered design right¹⁴⁸ has thus established the broadest derogation from free-market principles in the history of intellectual property law,¹⁴⁹ and it threatens to influence European Community law.¹⁵⁰

c. *Plant Varieties (UPOV)*. — In the agricultural industry as well, legislators have carved out an exception to the dominant legal paradigms protecting "inventions" and "artistic" works. Appropriating the benefits of a commercial plant breeder's know-how posed a daunting problem, because second comers could readily copy most innovations in agricultural biotechnology simply by obtaining exemplars of each new variety and replicating them naturally.¹⁵¹ Except for certain hybrid varieties that cannot be used as seed, trade secret protection is also generally not a viable option.¹⁵² Nor could plant breeders look to domestic or foreign patent laws for relief, because these laws typically excluded products of nature or any composition of matter discovered in nature from the list of statutory subject matter.¹⁵³

145. See Herman Cohen Jehoram, Cumulative Design Protection, A System for the EC?, in *Disegno Industriale e Protezione Europea* 55, 58–65 (Franco Benussi ed., 1989).

146. See Reichman, Designs Before 1976, *supra* note 121, at 1260–64.

147. See *supra* note 143.

148. See Copyright Designs and Patents Act, 1988, ch. 48, §§ 213–264 (Eng.); Christine Fellner, The New United Kingdom Industrial Design Law, 19 U. Balt. L. Rev. 369, 388–1989 (1989/1990).

149. Reichman, Information Law, *supra* note 62, at 339–40.

150. See Commission of the European Communities, Proposal for a European Parliament and Council Directive on the Legal Protection of Designs, (COM (93) 344 COD—final 464) (1993) [hereinafter Proposed EC Design Directive].

151. See, e.g., Donald N. Durick, Goals and Expectations of Industry for Intellectual Property Rights for Plant Materials, in *Intellectual Property Rights: Protection of Plant Materials* 21, 27 (P. Stephen Baenziger et al. eds., 1993).

152. See, e.g., Nicholas S. Seay, Intellectual Property Rights in Plants, in *Intellectual Property Rights: Protection of Plant Materials*, *supra* note 151, at 61, 74 (trade secret not an option in regard to "inbred line of plant variety where true-to-type seed is . . . sold to the general public," but may be an option for plants sold as hybrid seeds); Pioneer Hi-Bred Int'l v. Holden Found. Seeds, Inc., 35 F.3d 1226 (8th Cir. 1994) (corn seed breeder misappropriated trade secrets from competitor).

153. See, e.g., 35 U.S.C. § 101 (1988) (characterizing patentable subject matter in terms of processes, machines, manufactures, or compositions of matter); Brenner v. Manson, 383 U.S. 519, 528–31 (1966); Seay, *supra* note 152, at 61; see also Thomas E. Jurgensen, Of Plants, Patents, and Breeder's Rights: Some Proposals for International

The Plant Patent Act,¹⁵⁴ enacted in 1930 in the United States, awarded patent protection to asexually propagated plants¹⁵⁵ that met the thresholds of novelty, distinctness, and nonobviousness.¹⁵⁶ The Act was flawed in its exclusion of varieties propagated through pollination¹⁵⁷ (which account for most plants), and the rigidity of its formal and substantive prerequisites often frustrated even the incentives nominally afforded breeders of eligible varieties.¹⁵⁸ The Plant Patent Act, like the Design Patent Act, thus exerted only a "limited practical impact,"¹⁵⁹ and there is evidence that "this state of chronic underprotection resulted in

Unification of Proprietary Protection of Plant Biotechnology, 12 J. Agric. Tax'n & L. 291, 301 (1991) (noting some flexibility in French and German Law). For the softening of United States law in the 1980s, see *Diamond v. Chakrabarty*, 447 U.S. 303 (1980); *Ex parte Hibberd*, 227 U.S.P.Q. (BNA) 443 (Bd. Pt. App. I. 1985).

154. Act of May 23, 1930, 46 Stat. 376, amended by Act of Sept. 3, 1954, 68 Stat. 1190 (codified at 35 U.S.C. §§ 161–164 (1988)).

155. See 35 U.S.C. § 161 (1988). Plants invented by asexual reproduction entail propagation by grafting, budding, cutting, layering, division, and the like, but not by seeds. See, e.g., *Kim Bros. v. Hagler*, 167 F. Supp. 665, aff'd, 276 F.2d 259 (9th Cir. 1960). This left the great majority of plants, which reproduce by seed, unprotected. See, e.g., Liz Hanellin, Note, Protective Plant-Derived Drugs: Patents and Beyond, 10 Cardozo Arts & Ent. L.J. 169, 182–86 (1991). Bacteria, fungi, and tuber propagated plants were also excluded. See 35 U.S.C. § 161 (1988); *In re Arzberger*, 112 F.2d 834 (C.C.P.A. 1940); 1 Rosenberg, *supra* note 96, § 6.01[6][a].

156. See 35 U.S.C. §§ 103, 161, 162 (1988) (§ 161 applies all provisions of the general patent law to plant patents unless specifically excluded; § 162 relaxes the enablement requirement); *Yoder Bros. v. California-Florida Plant Corp.*, 537 F.2d 1347, 1377 (5th Cir. 1976), cert. denied, 429 U.S. 1094 (1977); see also 1 Rosenberg, *supra* note 96, § 6.01[4][a] (" 'Distinctness' means the aggregate of a plant's distinguishing characteristics," and there must be "at least one significantly different characteristic"). Since 1954, distinctness may also consist of a seedling that has been discovered in an area under cultivation, which is later asexually reproduced. See 35 U.S.C. § 161 (1988); *Yoder Bros.*, 537 F.2d at 1380; 1 Rosenberg, *supra* note 96, § 6.01[4][a].

157. See Hanellin, *supra* note 155, at 183.

158. See generally Peter K. Trzyna, Are Plants Protectable Under the Design Patent Act?, 69 J. Pat. & Trademark Off. Soc'y 487, 490 (1987). Apart from difficulties with focusing the distinctiveness standard on the innovator's specific variation, see, e.g., *Yoder Bros.*, 537 F.2d at 1378, the requirement of nonobviousness then excluded most of the otherwise novel and distinct varieties because the evolution of plant varieties is inherently incremental and almost never takes a big or "inventive" step beyond the prior art; Vito Mangini, The Protection of Plant Varieties in Italy and the UPOV Convention, Patent World 25, 26 (Nov. 1987). Even when a breeder overcomes these hurdles, the patent is limited to a single claim on the entire plant. An issued patent will not protect the "family" or multiple varieties of the claimed patent nor parts or products thereof, such as cut flowers or fruit. See, e.g., 35 U.S.C. §§ 162–163 (1988); Hanellin, *supra* note 155, at 182–83. Identifying a patented plant product and defining the scope of the patent is also hampered by natural genetic drift and spontaneous mutation.

159. Bernhard Bergmans, Industrial Property and Biological Diversity of Plant and Animal Species, 72 J. Pat. & Trademark Off. Soc'y 600, 606 (1990). But see H.R. Rep. No. 1605, 91st Cong., 2d Sess., at 2 (1970), reprinted in 1970 U.S.C.C.A.N. 5082, 5083–84 (describing impact of Plant Patent Act on flower, fruit, and nut industries).

insufficient investment in plant innovation, at least in the private sector."¹⁶⁰

Meanwhile, plant breeding technology evolved between 1930 and 1970 to the point where new sexually reproduced varieties could be replicated in ways that had previously appeared impossible.¹⁶¹ Leading European countries that had already derogated from the patent paradigm in regard to utility models and ornamental designs found *sui generis* protection of these new varieties both logical and expedient, especially in view of their reluctance to bring life forms within the domestic patent laws.¹⁶² In 1961, eight countries signed the International Convention for the Protection of New Varieties of Plants (UPOV), which adopted a *sui generis* regime, arguably built on modified copyright principles, for new plant varieties.¹⁶³ In response, Congress enacted the Plant Variety Protection Act (PVPA) of 1970¹⁶⁴ to protect the competitiveness of American agricultural products.¹⁶⁵ It amended the PVPA in 1981 to meet international minimum standards.¹⁶⁶

160. Reichman, *Information Law*, supra note 62, at 338. But see Bergmans, supra note 159, at 601-02, 605-07 (suggesting that long term public interest may be harmed by broader protection).

161. See, e.g., Seay, supra note 152, at 64 ("Sexually reproduced varieties are nonhybrid varieties or cultivars of plants that, for practical purposes, breed true-to-form when self-pollinated.").

162. See, e.g., European Patent Convention, supra note 64, art. 53(b), 13 I.L.M. at 286; Mangini, supra note 158, at 25 (noting that Italy was the only European country to apply its patent law to plant varieties); Jurgensen, supra note 153, at 300, 300 n.79 (citing Danish, German, and United Kingdom laws); see also Noel J. Byrne, *Plants, Animals, and Industrial Patents*, 16 *Int'l Rev. Indus. Prop. & Copyright L.* 1, 2 (1985) (noting exclusion of plant or animal varieties from United Kingdom's Patents Act of 1977, but stressing exception for microbiological processes including end products).

163. See UPOV, supra note 64, as amended again on March 19, 1991 (not yet in force) [hereinafter UPOV 1991]. To date, seventeen countries belong to UPOV including the United States, which joined in 1981. See generally UPOV, *The First Twenty-Five Years of the International Convention for the Protection of New Varieties of Plants* (UPOV Doc. No. 879(E), 1987) [hereinafter UPOV, *The First Twenty-Five Years*]. See also Rainer Moufang, *Protection for Plant Breeding and Plant Varieties—A Frontier of Patent Law*, 23 *Int'l Rev. Indus. Prop. & Copyright L.* 328, 345-48 (1992).

164. See Plant Variety Protection Act (PVPA), Pub. L. No. 91-577, 84 Stat. 1542 (1970), amended by Pub. L. No. 96-574, 94 Stat. 3350 (1980) (codified as amended at 7 U.S.C. §§ 2321-2583 (1988)). Prior to this Act, the United States had not deviated from the principle that unpatented, noncopyrightable innovation should fend for itself on the open market, which some thought implicit in the constitutional Enabling Clause. The PVPA, which never mentions "patents" but only "Certificates of Plant Variety Protection," 7 U.S.C. § 2481, was expressly grounded in both that Clause and the Commerce Clause. See, e.g., Seay, supra note 152, at 64.

165. See, e.g., H.R. Rep. No. 1605, supra note 159, at 1-3, reprinted in 1970 U.S.C.A.N. 5082, 5082-85.

166. See 1 Rosenberg, supra note 96, § 6.01[4][b], at 6-61. In protecting novel sexually propagated varieties under the PVPA, Congress confined innovative asexually propagated varieties to the Plant Patent Act (PPA) of 1930, 35 U.S.C. § 161 (1988). See, e.g., H.R. Rep. No. 1605, supra note 159, at 1-3 (1970), reprinted in 1970 U.S.C.A.N. 5082, 5082-84. To

The PVPA provides a registration system, administered by the Department of Agriculture rather than the patent authorities, which certifies varieties of sexually reproduced plants¹⁶⁷ that meet a basic criterion of novelty.¹⁶⁸ Statutory subtests of novelty emphasize stability, uniformity, or homogeneity, and above all, distinctiveness in the sense that registered varieties should be clearly distinguishable from existing varieties.¹⁶⁹ Non-obviousness is not required,¹⁷⁰ unlike in patent law, and the disclosure requirements are less exigent than those of patent law, though they can nonetheless be both costly and time-consuming.¹⁷¹

The PVPA, as initially adopted, provides a minimum of eighteen years of protection,¹⁷² and at first glance the bundle of exclusive rights it confers appears broad. For example, acts of infringement include selling, importing, or sexually multiplying the novel variety; using the variety to produce (but not to develop) a hybrid or different variety; using prohibited seed from propagation, or improperly distributing a protected variety.¹⁷³ In reality, the PVPA did not recognize a doctrine of equivalents as in patent law, because the certificate awards a right covering a specific variety only, which cannot infringe the right granted under

have applied both the PVPA and plant patents to sexually propagated varieties was inconsistent with UPOV (prior to 1991), which required an election and specified the prerequisites of eligibility under the treaty. See UPOV (prior to 1991), *supra* note 64, arts. 2(1), 6, 33 U.S.T. at 2708, 2711-12.

167. See 7 U.S.C. §§ 2321, 2401(f) (1988) ("The term 'sexually reproduced' shall include any production of a variety by seed."); *id.* § 2402(a) (excluding fungi, bacteria, or first-generation hybrids); *id.* § 2482. It seems probable that these requirements exclude varieties produced by cell fusion or "gene splicing," but this has not been settled. See, e.g., Eileen M. Baker, Note, Patents, Plants and Biotechnology—Policy and Law, 14 W. St. L. Rev. 529, 530-31 (1987).

168. See 7 U.S.C. §§ 2401(a), 2402(a) (1988). According to 1 Rosenberg, *supra* note 96, § 6.01[4][b][ii], at 6-67, novelty means that "the plant possesses a combination of characteristics not possessed by any known plant." The bars on prior commercialization and publication are the same as in patent law. See *id.* § 6.01[4][b], at 6-61 to 6-62.

169. See 7 U.S.C. § 2401(a)(1)-(3) (1988); Seay, *supra* note 152, at 64. Stability means reproduction true to form over the repeated propagations from seed. Homogeneity means that important characteristics should be uniform across a single planting in the sense that they can be described and predicted. See, e.g., 1 Rosenberg, *supra* note 96, § 6.01[4][b][ii], at 6-68. Distinctiveness requires that the new variety clearly differ by one or more morphological, physiological, or other characteristics, and may include a characteristic evidenced by processing (such as milling and baking in the case of wheat). See 7 U.S.C. § 2402(a)(1) (1988).

170. See, e.g., Baker, *supra* note 167, at 530. A requirement of nonobviousness would be inconsistent with the UPOV treaty itself. See UPOV, *supra* note 64, art. 6(2), 33 U.S.T. at 2712; 1 Rosenberg, *supra* note 96, § 6.01[4][b], at 6-63 to 6-66 (describing PVPA application process).

171. See, e.g., Trzyna, *supra* note 158, at 494 ("disclosure requirements are frequently associated with a prolonged endeavor involving considerable expense").

172. See 7 U.S.C. § 2483(b) (1988); 1 Rosenberg, *supra* note 96, § 6.01[4][b], at 6-61.

173. See 7 U.S.C. §§ 2483(a), 2541 (1988); Seay, *supra* note 152, at 65.

any other.¹⁷⁴ It also failed to recognize a derivative work right as in copyright law, because independently improved varieties that made use of a protected variety were not dominated by a certificate on the parental variety, even when a gene was spliced onto the protected original.¹⁷⁵ Moreover, the PVPA carved out broad exceptions from the scope of protection it nominally afforded. A farmers' exemption, for example, denied breeders the right to prevent third parties from propagating a registered variety for seeding purposes, and it permitted users to retain some of their harvest for subsequent planting.¹⁷⁶ Above all, a research exemption permitted use of a protected variety in subsequent breeding and generally allowed the resulting plant to be protected independently.¹⁷⁷ Taken together, these provisions added up to an elaborate anticopying regime and little else, which gave the original UPOV model its modified copyright character.¹⁷⁸

The weakness of this model elicited countervailing pressures for patent-like reform, primarily from large firms. These pressures resulted in the 1991 amendments to UPOV,¹⁷⁹ which increase the term of protection to twenty years, extend the scope of protection to harvested plant parts, cut back on the farmers' exemption, and required states to protect the

174. See 7 U.S.C. § 2541 (1988); see, e.g., Trzyna, *supra* note 158, at 494 ("[c]ertificates are genetically limited to one variety."); Seay, *supra* note 152, at 64–65 (noting absence of a judicial doctrine of equivalents).

175. See, e.g., *Pioneer Hi-Bred Int'l, Inc. v. Holden Foundation Seeds, Inc.*, No. 81-60-E, 1987 WL 341211 (S.D. Iowa, Oct. 30, 1987), *aff'd*, 35 F.3d 1226 (8th Cir. 1994); Seay, *supra* note 337, at 65. See generally, Joseph Straus, *The Principle of "Dependence" Under Patents and Plant Breeders' Rights*, 26 *Indus. Prop.* 433, 434–438 (1987).

176. See 7 U.S.C. § 2543 (1988); see also *Asgrow Seed Co. v. Winterboer*, 989 F.2d 478, 479 (Fed. Cir. 1993) (Rader, J., concurring) (stating that crop exemption "does not limit the amount of seed a farmer may sell to the amount necessary to plant another crop"), *cert. granted*, 114 S. Ct. 1535 (1994); *Asgrow Seed*, 989 F.2d at 483 (Newman, J., dissenting) (stating that "statute does not authorize the farmer to go into the commercial seed business with half of each crop of certified variety"); Jurgensen, *supra* note 153, at 301; William Lesser, *Anticipating UK Plant Variety Patents*, 9 *Eur. Intell. Prop. Rev.* 172, 175–76 (1987).

177. See 7 U.S.C. § 2544 (1988); see also Morgan A. Chu et al., *Bringing Intellectual Property Law Down to Earth: An Introduction to the Plant Variety Protection Act*, J. *Proprietary Rts.*, May 1990, at 2, 2–9; Straus, *supra* note 175, at 434–38. Other derogations from the exclusive rights include compulsory licensing and a series of exemptions for saved seed. See 7 U.S.C. §§ 2404, 2543 (1988); Seay, *supra* note 152, at 65.

178. See, e.g., S. Rep. No. 1138, 91st Cong., 2d Sess. 11 (1970) (stating that "infringement is expected almost never to be by independent work, but by willful reproduction starting from the protected variety itself"); Seay, *supra* note 152, at 65.

179. See UPOV 1991, *supra* note 163; Barry Greengrass, *Non-U.S. Protection Procedures and Practices—Implications for U.S. Innovators?*, in *Intellectual Property Rights: Protection of Plant Materials*, *supra* note 151, at 41, 49–52. The United States is a signatory to this revision, which mandates changes in U.S. law, see Seay, *supra* note 152, at 65. These changes have recently been implemented. See *Plant Variety Protection Act Amendments of 1994*, Pub. L. No. 103-349, 108 Stat. 3136 (Oct. 6, 1994).

whole plant kingdom and not merely selected species.¹⁸⁰ Above all, the definitions of infringement now encompass a right to a derived variety by prohibiting reproduction and sale of a variety developed from and expressing the "essential characteristics" of a protected variety.¹⁸¹ This provision addresses the predicament of plant breeders, who had little protection when second comers inserted bioengineered genes into a protected variety and were denied multiple royalties recurring from a chain of creations "predominantly derived" from the original discovery.¹⁸² On October 6, 1994, the United States amended the PVPA to conform to the 1991 revision of the UPOV treaty.¹⁸³

Far from resolving the conflicts among different interest groups, the recent amendments to UPOV may only have exacerbated the fears of each and left them all dissatisfied.¹⁸⁴ The long-term implications of any solution for biotechnology in general has further intensified the debate among those who favor a full patent approach, a modified patent approach, or a modified copyright approach.¹⁸⁵

180. See UPOV 1991, *supra* note 163, arts. 3, 14–15, 19; Greengrass, *supra* note 179, at 49–52. Article 14(1) redefines the minimum rights so as to cover all production of propagating material; this eliminates the saved-seed exception. Hence, Article 15(2) permits (but does not require) governments "within reasonable limits" to exclude farm-saved seed from the breeder's right, and implementation will vary among the member countries. See *id.* at 49–50; see also John H. Barton, Introduction: Intellectual Property Rights Workshop, in *Intellectual Property Rights: Protection of Plant Materials*, *supra* note 151, at 13, 13–16. Article 2(1) of the Revision also allows for the first time cumulative or overlapping protection between plant breeders' rights and patents. See Greengrass, *supra* note 179, at 52.

181. See UPOV 1991, *supra* note 163, art. 14(5).

182. See, e.g., Greengrass, *supra* note 179, at 50–52. In practice, the research exemption combined with the statutory restriction of a breeder's certificate to a single variety enabled second comers to claim that variations developed from the protected variety constituted new, different, and even protectible varieties of their own. See Trzyna, *supra* note 158, at 494. In contrast, UPOV 1991, *supra* note 163, art. 14(5) provides that a variety that is essentially derived from a protected variety cannot be exploited without authorization of the breeder of the protected variety, and it broadly defines the term "predominantly derived." The expectation is that greater resort to private licensing agreements will result in order to overcome the original breeder's new right to dominate derivatives that differ slightly or make significant use of the original discovery. See, e.g., Barton, *supra* note 180, at 14; Greengrass, *supra* note 179, at 51.

183. See S. 1406, Pub. L. No. 103-349, signed Oct. 6, 1994; *supra* note 178.

184. See Durick, *supra* note 151, at 23–24 (noting conflicting fears of small seed companies, developing countries, farmers' groups, traditional plant breeders, social action groups, and commercial breeders). Compare Mangini, *supra* note 158, at 31 (fearing underprotection of new plant varieties under original UPOV model) with Bergmans, *supra* note 159, at 601–02 (noting arguments that soft substantive prerequisites favor cosmetic alterations rather than real improvements), while strong protection favors oligopolistic market structures, "genetic erosion," and possible reduction of diversity).

185. Tension between a full patent approach, which typically recognizes a broader range of equivalents, and the PVPA (or UPOV) approach has become acute since the United States Supreme Court in *Chakrabarty* made utility patents theoretically available for the products and processes of biotechnology in general. See *Diamond v. Chakrabarty*, 447

In practice, the strict formal and substantive prerequisites of patent law have raised serious doubts about its ability adequately to protect biotechnological innovation in general,¹⁸⁶ including biogenetic advances in plant breeding.¹⁸⁷ Apart from well-known problems of deposit and enablement,¹⁸⁸ for example, dissatisfaction with the emerging case law on nonobviousness stems in part from a judicial tendency to deny protection to costly biotechnological processes that yield major commercial and societal gains.¹⁸⁹ These exclusionary effects may grow more troublesome over time.¹⁹⁰ Even the broad doctrine of equivalents available from patent law becomes a two-edged sword when courts view synthetic products of recombinant DNA technology as infringing upon patents covering natural products obtained by earlier methods.¹⁹¹ These and similar ten-

U.S. 303 (1980); Jurgensen, *supra* note 153, at 302-03; see also Stephen Crespi, *Innovation in Plant Biotechnology: The Legal Options*, 9 *Eur. Intell. Prop. Rev.* 262 (1986); Bernard M. Roth, *Current Problems in the Protection of Inventions in the Field of Plant Biotechnology—A Positive Paper*, 18 *Int'l Rev. Indus. Prop. & Copyright L.* 41, 52-53 (1987); Joseph Straus, *The Relationship Between Plant Variety Protection and Patent Protection for Biotechnological Inventions from an International Viewpoint*, 18 *Int'l Rev. Indus. Prop. & Copyright L.* 725, 736-38 (1987).

186. See, e.g., Iain Purvis, *Patents and Genetic Engineering—Does a New Problem Need a New Solution?*, 9 *Eur. Intell. Prop. Rev.* 347, 348 (1987); John M. Czarnetzky, *Note, Altering Nature's Blueprints for Profit: Patenting Multicellular Animals*, 74 *Va. L. Rev.* 1327, 1355 (1988); *infra* note 193 (listing commentators who advocate copyright-like protection of biotechnological innovation or intermediate, *sui generis* solutions). But see James Mellor, *Patents and Genetic Engineering—Is It a New Problem?*, 10 *Eur. Intell. Prop. Rev.* 159, 161-62 (1988) (arguing against any derogation from classical patent paradigm).

187. See, e.g., Jurgensen, *supra* note 153, at 311-32; Trzyna, *supra* note 158, at 494-98.

188. See generally Joseph Straus & Rainer Moufang, *Deposit and Release of Biological Material for the Purposes of Patent Procedure* (1990).

189. See, e.g., *In re Durden*, 763 F.2d 1406, 1410 (Fed. Cir. 1985); David Beier & Robert H. Benson, *Biotechnology Patent Protection Act*, 68 *Denv. U. L. Rev.* 173, 176-78 (1991); R. Stephen Crespi, *Inventiveness in Biological Chemistry: An International Perspective*, 73 *J. Pat. & Trademark Off. Soc'y* 351, 356-59 (1991). But see *In re Pleuddemann*, 910 F.2d 823 (Fed. Cir. 1990) (arguably lowering nonobviousness standard for process patents and distinguishing *Durden*).

190. See, e.g., Lorraine L. Greenlee, *Biotechnology Patent Law: Perspective of the First Seventeen Years, Prospective on the Next Seventeen Years*, 68 *Denv. U. L. Rev.* 127, 135-36 (1991) (predicting routinization of processes, including use of basic technologies for isolating structures that are used to generate other compounds with equivalent function).

191. See, e.g., *Amgen Inc. v. Chugai Pharmaceutical Co.*, 13 U.S.P.Q.2d (BNA) 1737, 1764-69 (D. Mass. 1989), *rev'd on other grounds*, 927 F.2d 1200 (Fed. Cir. 1991), *cert. denied*, 112 S. Ct. 169 (1991); *Scripps Clinic & Research Found. v. Genentech, Inc.*, 666 F. Supp. 1379, 1389-95 (N.D. Cal. 1987), *aff'd*, 927 F.2d 1565 (Fed. Cir. 1991). See generally Jeffrey P. Kushan, *Comment, Protein Patents and the Doctrine of Equivalents: Limits on the Expansion of Patent Rights*, 6 *High Tech. L.J.* 109 (1991); Harold C. Wegner, *Purified Protein Patents: "A Legal Process Gone Berserk?"*, 12 *Eur. Intell. Prop. Rev.* 187 (1990); Michael S. Greenfield, *Note, Recombinant DNA Technology: A Science Struggling with the Patent Law*, 44 *Stan. L. Rev.* 1051 (1992).

sions, in addition to inspiring efforts to reduce the nonobviousness standard applied to biogenetic processes in general¹⁹² or even to provide copyright protection for biogenetic innovation,¹⁹³ have stimulated interest in the PVPA (or UPOV approach) as a possible model for a sui generis regime that could protect biotechnological innovation better than the full patent paradigm.¹⁹⁴

Whatever the outcome of this larger debate, congressional enactment of the PVPA in 1970 represented the first significant United States departure from the classical (and some thought constitutional) tradition limiting intellectual property rights in this country to the protection of "inventions" and "artistic works."¹⁹⁵ The PVPA thus paved the way to the Software Protection Act of 1980 and the Semiconductor Chip Protection Act of 1984,¹⁹⁶ which represented turning points in the history of world intellectual property law as well. Legal protection of plant varieties thus opened the door to domestic protectionist pressures from innumerable industries that previously had not dreamed of circumventing the negative economic premises underlying the classical patent and copyright systems.

d. *Technology Protection in Unfair Competition Law.* — Although neither the domestic nor international unfair competition laws traditionally repressed imitation as such, courts in nearly all countries periodically draw upon the misappropriation rationale (to the effect that one "should not reap where he has not sown") to curb methods of imitation that appear egregiously unethical or market-distorting to particular judges.¹⁹⁷

192. See, e.g., H.R. 3957, 101st Cong., 2d Sess. (1990) (proposing to overrule *Durden* by mandating that a novel input or output could make a process as a whole nonobvious); Beier & Benson, *supra* note 189; 43 BNA Pat. Trademark & Copyright J. 63 (1991) (discussing H.R. 1417).

193. See, e.g., Michael A. Epstein, *Modern Intellectual Property* 434-38 (2d ed. 1989); Dan L. Burk, Copyrightability of Recombinant DNA Sequences, 29 *Jurimetrics J.* 469, 492-512 (1989); Doreen M. Hogle, Copyright for Innovative Biotechnological Research: An Attractive Alternative to Patent or Trade Secret Protection, 5 *High Tech. L.J.* 75, 117-22 (1990); Irving Kayton, Copyright in Living Genetically Engineered Works, 50 *Geo. Wash. L. Rev.* 191, 216-18 (1982); Donna Smith, Copyright Protection for the Intellectual Property Rights to Recombinant Deoxyribonucleic Acid: A Proposal, 19 *St. Mary's L.J.* 1083, 1108-09 (1988).

194. See, e.g., Jurgensen, *supra* note 153, at 310-33; William Lesser, Patenting Seeds in the United States of America: What to Expect, 25 *Indus. Prop.* 360 (1986). Affinities between the problems of patenting plant varieties and those of patenting second-generation biotechnological analogs are easy to draw, and the difficulties of overcoming the nonobviousness standard applicable to second-generation biotechnological analogs are said to resemble those faced by plant breeders under the plant patent act.

195. See *supra* text accompanying notes 73-88; cf. Kenneth F. Burchfiel, The Constitutional Intellectual Property Power: Progress of Useful Arts and the Legal Protection of Semiconductor Technology, 28 *Santa Clara L. Rev.* 473, 482-93 (1988).

196. See *infra* notes 205, 270.

197. See Walter J. Derenberg, The Influence of the French Code Civil on the Modern Law of Unfair Competition, 4 *Am. J. Comp. L.* 1, 1-8 (1955) (tracing late development of statutory intellectual property rights, including trademark law, in civil law countries to judge-made concepts of fair trade developed under authority of Napoleonic Code).

In principle, if not in judicial practice, however, legislative adoption of a general-purpose anticopying norm appeared inconsistent with the competitive ethos of market economies, which holds that "imitation is the life blood of competition."¹⁹⁸ So, for example, when California and several other state legislatures in the United States recently prohibited the duplication and sale of any product made from a direct mold of a competitor's product (i.e., by wholesale duplication of the originator's product),¹⁹⁹ the United States Supreme Court invalidated these statutes as an unwarranted intrusion on the federal intellectual property system.²⁰⁰ The Court thus relegated unpatented, noncopyrightable product designs to the open market and endowed the competitor's right to reverse engineer with constitutional underpinnings.²⁰¹

Unfortunately, when the results of costly technological research and development are embodied in the product itself, as frequently occurs today, no reverse engineering may be necessary. Second comers can simply duplicate the originator's product as a whole—often by refined technological means—and obtain the same technical result at low marginal costs.²⁰² In other words, the Court neglected to explain how healthy competition would occur if manufacturers facing certain and rapid appropriation of their unpatentable research results by competitors using the direct mold process failed to invest further in research and development unless it led to patentable breakthroughs.²⁰³

However, the English-speaking countries never followed the French tradition and seldom recognized unfair competition claims other than "passing off," which was derived from trademark law. See, e.g., *Derenburg*, *supra*, at 5–7 (identifying *International News Serv. v. Associated Press*, 248 U.S. 215 (1918), as a major departure that moved toward French tradition).

198. *American Safety Table Co. v. Schreiber*, 269 F.2d 255, 272 (2d Cir. 1959) (Medina, J.), cert. denied, 361 U.S. 915 (1959); see Paris Convention, *supra* note 4, art. 10*bis*, 21 U.S.T. at 1648 (specifically recognizing likelihood of confusion, but not misappropriation, as contrary to honest business practices); *Kellogg Co. v. National Biscuit Co.*, 305 U.S. 111, 122 (1938) (Brandeis, J.); Friedrich-Karl Beier, *The Law of Unfair Competition in the European Community—Its Development and Present Status*, 16 *Int'l Rev. Indus. Prop. & Copyright L.* 139, 141–49 (1985); Reichman, *GATT Connection*, *supra* note 8, 780–95.

199. See, e.g., Cal. Bus. & Prof. Code § 17300 (West 1987), repealed by ch. 647, 1991 Stat. § 4; Fla. Stat. Ann. § 559.94 (West 1988), repealed by ch. 91-223, 1991 Stat. § 9 (prohibiting copying of boat hulls through direct molding).

200. See *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141 (1989).

201. See *Bonito Boats*, 489 U.S. at 159–60; Reichman, *The United States Experience*, *supra* note 44, at 113–15. But see Reichman, *The United States Experience*, *supra*, at 98–113 (criticizing use of misappropriation rationale to protect product configurations as appearance trade dress).

202. The boat hull design in *Bonito Boats*, for example, was technically refined and costly to produce, but the end result was simply duplicated with no contribution to research and development.

203. See Frank H. Easterbrook, *Intellectual Property is Still Property*, 13 *Harv. J.L. & Pub. Pol'y* 108, 114–18 (1990); John S. Wiley, Jr., *Bonito Boats: Uninformed but*

Similar concerns about insufficient lead-time advantages had led reformers in the late 1950s to propose a six-month grace period during which an unregistered appearance design could have been protected against slavish imitation while its proprietor tested the market to determine whether registration was warranted.²⁰⁴ Although Congress omitted this design bill from the General Revision of Copyright Law enacted in 1976, a refined version of this principle entered the Semiconductor Chip Protection Act of 1984²⁰⁵ by something of an historical accident.²⁰⁶ The same principle has subsequently found its way into pending proposals for a European Union Directive on the legal protection of designs as well as the domestic chip laws modelled on the American initiative.²⁰⁷ Moreover, in the process of considering its response to the reciprocity provision of the United States chip act,²⁰⁸ the usually staid Swiss government took the unprecedented step of elevating this principle of an anticopying grace period to a basic norm of its 1988 unfair competition law while otherwise permitting reverse engineering by competitors who avoid wholesale duplication of new technological products.²⁰⁹

The Swiss law focuses on protecting investment in unpatented technologies that are vulnerable to easy duplication rather than restricting the technical achievements themselves.²¹⁰ The law imposes a general duty on competitors to reverse engineer by proper means, even in the absence of actual secrecy, which in turn endows innovators with lead time against what the drafters consider commercial parasitism.²¹¹ However, the lack of a specific term of duration and of other particulars distinguishing licit from illicit competition leave implementation of this statu-

Mandatory Innovation Policy, 1989 Sup. Ct. Rev. 283, 296-302 (stressing lack of empirical knowledge as to when lead time suffices and when it does not).

204. See S. 2075, 86th Cong., 1st Sess. §§ 4, 8(d), 9(a) (1959); Reichman, *Designs Before 1976*, supra note 121, at 1190-95.

205. Semiconductor Chip Protection Act of 1984, Pub. L. No. 98-620, 98 Stat. 3347 (1984), (codified as amended at 17 U.S.C. § 908(a) (1988)) [hereinafter SCPA] (protection of unregistered mask work terminates if application for registration is not made within two years of first commercial exploitation).

206. The historical accident was that, when the push for copyright protection of integrated circuit designs failed to win key legislative support, proponents of some form of protection hurriedly fell back upon the proposed but never enacted design bill and incorporated many of its "design copyright" concepts into early versions of what became the SCPA. See, e.g., Kastenmeier & Remington, supra note 59, at 424-30.

207. The Proposed EC Design Directive, supra note 150, would establish a two-tiered approach that provides three years of automatic protection against slavish copying and a maximum of twenty-five years of stronger protection for registered, novel designs. See EC Explanatory Memorandum on Designs, supra note 117, at 7-8.

208. See *infra* note 245 and accompanying text.

209. See Federal Law on Unfair Competition of Dec. 1986 [Switzerland] (effective Mar. 1, 1988), art. 5(c), reprinted in *Industrial Property Laws & Treaties*, supp. 1988; see also Reichman, *Information Law*, supra note 62, at 341; Probst, *Protection of Integrated Circuits in Switzerland*, 10 *Eur. Intell. Prop. Rev.* 108 (1988).

210. See Probst, supra note 209, at 109-10.

211. See *id.* at 108.

tory norm at the mercy of courts, and the Swiss courts have been unremittingly hostile to the statute so far.²¹²

In 1993, the Japanese government also adopted a general-purpose anticopying norm, modelled in part on the Swiss regime, as part of a sweeping reform of the Japanese Unfair Competition Act.²¹³ The new law expressly targets wholesale or slavish imitation that deprives investors of a return on their investment by unduly shortening the life cycle of innovative goods, and it aims to stimulate suitable levels of investment in the development of unique products.²¹⁴ In contrast with the open-ended but inherently ambiguous provisions of the Swiss regime, the Japanese law simply forbids slavish duplication of new industrial product configurations for a three-year period from the time the relevant products become available to the public.²¹⁵ In effect, this approach generalizes the two-year grace period that semiconductor chip protection laws normally provide to unregistered integrated circuit designs²¹⁶ without otherwise imitating any of the exclusive rights regimes. The legislative history further indicated that ideas and concepts remain unprotected, that courts will make exceptions for purposes of attaining standardization and compatibility between products, and that competitors who need to duplicate a particular configuration in order to reach a certain functional result may claim immunity.²¹⁷ Competitors who invest funds of their own to modify or to improve existing products should also avoid liability.²¹⁸

Meanwhile, concerns about the ease with which databases and other electronic information tools can be duplicated²¹⁹ have led European scholars, courts, and administrators to consider expanding the various unfair competition laws to embrace a tort of "parasitic competition."²²⁰

212. See Prof. François Dessemontet, Lecture at Vanderbilt Law School (April 1994); see also François Dessemontet, Programmes d'ordinateur: L'avenir de leur protection légale, *Cedidac Bull. D'information* (Switzerland), no. 22, June 1994, at 2 (citing authority).

213. See The Unfair Competition Act [Japan], Law No. 47/1993, May 19, 1993, Section 2(3); see also Institute of Intellectual Property [Japan], Concerning the Revision of Unfair Competition Prevention Law in Japan 29-46 (1993) [hereinafter Unfair Competition in Japan]; Guntram Rahn & Christopher Heath, What Is Japanese About the Japanese Unfair Competition Act, 25 *Int'l Rev. Indus. Prop. & Copyright L.* 343, 352-54 (1994).

214. See Unfair Competition in Japan, *supra* note 213, at 29-30, 38-44.

215. See *supra* note 213.

216. See *supra* note 204 and accompanying text; see also Unfair Competition in Japan, *supra* note 213, at 44 (survey evidence showing age of model changes to be three years or less).

217. See Unfair Competition in Japan, *supra* note 213, at 45.

218. See *id.* at 39. Whether courts will impose a requirement of originality on these modifications remains to be seen. See Rahn & Heath, *supra* note 213, at 353.

219. See generally, Reichman, Electronic Information Tools, *supra* note 48, at 446-47, 462-75.

220. See, e.g., Christian Le Stanc, The Rights of the Creator of Information in France, 11 *Eur. Intell. Prop. Rev.* 32, 34 (1989); Jean-Marc Mousseron, La Protection du Savoir-

These efforts aim particularly to safeguard investment in unpatented, noncopyrightable embodiments of know-how, and they readily invoke the Swiss experiment.²²¹ Scholars in English-speaking countries, which traditionally take a more restrictive approach to unfair competition law,²²² have independently reached similar conclusions.²²³ Were such a tort to receive widespread recognition, "parasitic competition" could become assimilated to other acts that Article 10*bis* of the Paris Convention already prescribes.

Viewed as a basis for promoting technological innovation in the long term, however, the misappropriation branch of unfair competition law raises more questions than it answers. While this body of law has always performed yeoman's service in identifying areas in need of systematic rationalization, it characteristically proceeds on a hit-or-miss basis that varies with the outlook of single judges; there are no well-defined objects of protection, no sure standards of eligibility, and few safeguards to balance the interests of all concerned, including the public interest. What nonetheless seems truly remarkable about both the Swiss and Japanese unfair competition laws, despite their makeshift character, is that they attempt to provide originators of unpatented, noncopyrightable innovation with artificial lead time in which to recoup their investments, while declining to grant these same innovators any exclusive property rights. By resorting to less intrusive liability rules rather than exclusive property rights, in other words, these experiments afford an alternative to the more protectionist regimes that have multiplied in recent years. Their deeper implications are explored later in this study.

2. *Selected Marginal Cases in the Spectrum of Artistic and Quasi-Artistic Property.* — The subsections that follow describe old and new deviations from the classical copyright paradigm.²²⁴ The order of presentation attempts to express a movement from objects of protection that are decidedly industrial in character toward matter that more clearly resembles works of art and literature in the historical and ordinary sense. The order thus also reflects a judgment about the relative distance separating any given subject matter covered by these deviant regimes from the classi-

Faire (Know-How) 10-14 (paper presented to the conference on "Exporter Notre Technologie: Protection et Transfert Internationaux des Innovations, University of Ottawa, Canada, Faculty of Law, Nov. 17, 1993) (citing case law).

221. See, e.g., Mousseron, *supra* note 220.

222. See *supra* note 197.

223. See, e.g., Gordon, *supra* note 43; see also Dennis S. Karjala, Copyright and Misappropriation, 17 U. Dayton L. Rev. 885 (1992); C. Owen Paepke, An Economic Interpretation of the Misappropriation Doctrine: Common Law Protection for Investments in Innovation, 2 High Tech. L.J. 55 (1987); Andrew Terry, Unfair Competition and the Misappropriation of a Competitor's Trade Values, 51 Modern L. Rev. 296 (1988). But see Leo J. Raskind, The Misappropriation Doctrine as a Competitive Norm of Intellectual Property Law, 75 Minn. L. Rev. 875, 896-905 (1991).

224. For further discussion of deviations from the copyright regime, see Reichman, Information Law, *supra* note 62, at 341-48.

cal line of demarcation with industrial property law, cast in terms of the general products market. In practice, such distinctions are matters of degree, and some readers might rank the relevant hybrid regimes differently. As will be seen, these ambiguities confirm the extent to which the classical line of demarcation has itself broken down under pressure of events and increasingly yields arbitrary and incoherent results.

a. *Technical Drawings, Blueprints, and Engineering Projects.* — As this author's earlier research has shown, technical drawings, blueprints, and engineering projects "constitute some of the oldest and most instructive marginal cases in the intellectual property universe."²²⁵ Because of their dual nature as both artistic and functional works, these objects of protection raise issues strikingly similar to those raised by computer programs. A review of the various national approaches confirms that while these subject matters often receive some form of copyright protection, innovators usually cannot also invoke trade secret law to protect the underlying technical ideas. Appropriability remains a real risk, undermining innovators' incentive to invest in new applications of technical ideas to engineering design and construction.

Apart from the various domestic attempts to reconcile copyright protection of technical drawings with the competitor's right to reverse engineer the useful articles they portray, the most important solution for purposes of this study is the Italian neighboring right which protects engineering projects and is built on pure liability principles.

Article 99 of the Italian Copyright Law allows authors of engineering projects or other analogous productions who contribute novel (but not nonobvious) solutions to technical problems to obtain a reasonable royalty from third parties who commercially exploit their technical contributions without authorization. This right to "equitable compensation" lasts twenty years from the date of registration, and appropriate notice must appear on copies of the plans.²²⁶ Disclosure of a technical solution via registration, although a necessary condition, confers no right against third parties who independently arrive at similar solutions by their own means and without resort to the registered solutions. Nor does the regime protect technical ideas in the abstract, as distinguished from their application to specific solutions to problems arising in actual projects. In these and other respects, the Italian law anticipated the United States Semiconductor Chip Protection Act of 1984, which permits reverse engineering and recognizes independent creation as a perfect defense.

The Italian law protecting engineering projects is the only hybrid regime that substitutes a fully developed compensatory mechanism for the characteristic grants of exclusive property rights. Resort to a liability regime in this instance thus constituted a path-breaking experiment, one

225. See *id.* at 341.

226. See Italian Copyright Law, Law No. 633 of April 22, 1941, as amended through July 29, 1989, art. 99; Eduardo Piola Casselli, *Codice del Diritto di Autore* 510-11 (1943).

whose stability over time contrasts with the volatility of hybrid regimes based on modified patent or copyright principles.

b. *Integrated Circuit Designs*. — The two-dimensional layout design of a semiconductor chip resembles other engineering designs and technical drawings that copyright laws protect against unauthorized reproduction.²²⁷ Such protection, however, does not usually extend either to the three-dimensional chip portrayed in the designs or to the functional result obtained by implementing the two-dimensional drawing in a three-dimensional physical support.²²⁸ Given the wholly functional character of integrated circuit designs, moreover, they could not qualify either as "sculptural works" within the separability test of the 1976 Copyright Act,²²⁹ or as subject matter eligible for design patent protection.²³⁰ Therefore, once innovators embody novel but legally obvious integrated circuit designs in semiconductor chips distributed on the open market, they become as vulnerable to rapid appropriation by third-party duplicators as those who develop, say, new technical solutions applied to engineering and construction projects.²³¹ In 1984, the United States Congress, which had never seen fit to protect functional designs either as utility models or as engineering projects,²³² responded to sectoral lobbying pressures by enacting a prototypical regime to be known as the Semiconductor Chip Protection Act of 1984 (SCPA).²³³

The SCPA affords short-term, copyright-like protection to "mask works," that is, to the surface images of integrated circuit designs that are embodied in semiconductor chip products.²³⁴ Like copyright law, the

227. See 17 U.S.C. § 101 (1988 & Supp. V 1993) (definition of pictorial, graphic, and sculptural works); *id.* §§ 106(1)–(2), 113(a).

228. See 17 U.S.C. §§ 101 (1988) (definition of pictorial, graphic, and sculptural works); *id.* §§ 102(b), 113(b); *Mazer v. Stein*, 347 U.S. 201 (1954); *Baker v. Selden*, 101 U.S. 99 (1879).

229. See 17 U.S.C. § 101 (1988).

230. See 35 U.S.C. §§ 101, 171 (1988) ("any new, original and ornamental design for an article of manufacture"); *supra* notes 119–121 and accompanying text.

231. See *supra* notes 72, 86, 95 and accompanying text.

232. See *Kastenmeier & Remington*, *supra* note 59, at 419. However, enactment of the Plant Variety Protection Act in 1970, *supra* note 164, anticipated this development.

233. See SCPA, *supra* note 205. See generally *Kastenmeier & Remington*, *supra* note 59, at 424–30 (providing legislative history of SCPA). For evidence that the decisive motivating factor was the rise of Japanese chip industries, see Leo J. Raskind, *Reverse Engineering, Unfair Competition, and Fair Use*, 70 Minn. L. Rev. 385, 413–15 (1985) (noting that advantages derived from chip copying were consolidated by superior quality control).

234. See 17 U.S.C. §§ 901, 902, 904, 905, 913, 914 (1988 & Supp. V 1993); *Dratler*, *supra* note 15, §§ 8.01[1], [3]–[4]. The purpose of the SCPA is to protect designs of semiconductor chip products. Rather than using the term "design," however, the statute creates a new form of intellectual property, termed "mask work," which "comprises the abstract information in the set of masks used to manufacture a particular semiconductor chip product." *Id.* § 8.03[1].

SCPA requires originality²³⁵ and fixation,²³⁶ and does not protect "any idea, procedure, process, system, method of operation, concept, principle, or discovery."²³⁷ The Act provides ten years of protection if eligible mask works are registered, although a two-year grace period permits owners to defer registration without forfeiture while commercially exploiting their works.²³⁸

The SCPA protects eligible mask works against copying only,²³⁹ but not against independent creation. While the SCPA resembles the Italian regime protecting engineering projects in this respect, the latter gives third parties a built-in license to use a protected project design in return for a reasonable royalty, whereas the SCPA authorizes third parties to reverse engineer publicly distributed chip designs, or parts thereof, only for purposes of analytical use.²⁴⁰ On this principle, a competitor has not copied a protected mask work if his or her own independently generated chip design incorporates the results of reverse engineering and meets the statutory test of originality.²⁴¹ In close cases, however, courts implementing the SCPA require a third party who reverse engineers a protected mask work to show that his or her allegedly infringing mask work enhances the performance of the semiconductor chip products in question.²⁴²

By excluding circuit designs "that are staple, commonplace, or familiar in the semiconductor industry"²⁴³ and by encouraging reverse engineering, the SCPA resembles a statutory form of trade-secret-like protec-

235. See 17 U.S.C. § 902(b)(1), (2) (1988); see also H.R. Rep. No. 781, 98th Cong. 2d Sess. 17 (1984).

236. See 17 U.S.C. § 901(a)(6) (1988).

237. *Id.* §§ 901(a)(2), 902(c) (1988).

238. See *id.* §§ 904, 908(a).

239. See *id.* § 905(1) (1988); see also Dratler, *supra* note 15, § 8.04[1][b] (noting, in addition to slavish or literal copying, nonverbatim copying of the entire mask work and exact copying of an important portion of the mask work, such as a cell from a cell library, are prohibited). In addition to exclusive reproduction and distribution rights, 17 U.S.C. § 905 (1988), the SCPA also provides owners of mask works with the exclusive right to import a semiconductor chip product in which the mask work is embodied. See *id.* § 910(a) (1988 & Supp. V 1993); H.R. Rep. No. 781, *supra* note 235, at 25-26.

240. See 17 U.S.C. § 906(a)(1)-(2) (1988).

241. See *Brooktree Corp. v. Advanced Micro Devices, Inc.*, 977 F.2d 1555, 1565 (Fed. Cir. 1992); see also John G. Rauch, *The Realities of Our Times: The Semiconductor Chip Protection Act of 1984 and the Evolution of the Semiconductor Industry*, 75 J. Pat. & Trademark Off. Soc'y 93, 117-23 (1993).

242. See *Brooktree Corp. v. Advanced Micro Devices, Inc.*, 977 F.2d at 1569; see also Raskind, *supra* note 233, at 402; Rauch, *supra* note 241, at 121 ("The legitimate reverse engineer may leave no paper trail, while the pirate can readily invent one."). But see Harold R. Brown, Note, *Fear and Loathing of the Paper Trail: Originality in Products of Reverse Engineering Under the Semiconductor Chip Protection Act as Analogized to the Fair Use of Nonfiction Literary Works*, 41 Syracuse L. Rev. 985, 1006-08, 1012-14 (1990) (arguing that "a good faith attempt to enhance technology" should satisfy the originality test, even if no functional superiority was attained).

243. 17 U.S.C. § 902(b)(2) (1988).

tion for an industry whose know-how is easily appropriated by technological means.²⁴⁴ This, in turn, leads to the question of why this particular class of functional designs merits an exemption from the discipline of the marketplace more than other classes of socially valuable innovation that are similarly vulnerable to free-riding duplicators.

The SCPA and its accompanying reciprocity clause²⁴⁵ represent a protectionist step that has led other countries to grant copyright-like protection to functional designs without requiring an appreciable creative contribution. Two examples of this effect are the 1988 United Kingdom legislation on unregistered design rights and the European Union's proposed Directive on the legal protection of industrial designs. Its influence can also be seen in the technology misappropriation laws recently enacted in Japan and Switzerland.²⁴⁶ Only the latter, however, abandon the exclusive property rights model altogether, in company with that early and ingenious Italian regime devised to protect engineering designs in general.

c. *Industrial Literature: Computer Programs and Electronic Information Tools.* — As both writings and textual machines that behave in functionally significant ways,²⁴⁷ computer programs pose some of the same problems for the mature copyright paradigm as engineering projects and technical drawings do. Many utilitarian literary productions, from scientific works to instruction manuals and printed forms, manifest a similar dual nature; the resulting pressure on the line of demarcation with pat-

244. See, e.g., H.R. Rep. No. 781, supra note 235, at 2-3 (finding that mask works can be easily and inexpensively copied); see also Reichman, *The United States Experience*, supra note 44, at 136-38.

245. In characterizing the SCPA as a set of rights allied with copyright law but not within the international copyright conventions, rather than as a form of industrial property within the Paris Convention, Congress in effect conditioned the protection of foreign chip designs on a showing of material reciprocity between U.S. law and that of the foreign producers' own states. See 17 U.S.C. §§ 902(a)(1)(A)-(C), 913, 914 (1988 & Supp. III 1991) (allowing protection for foreign mask works that are first commercially exploited in this country, or that are covered by an apposite treaty, or that fall within a presidential proclamation recognizing that material reciprocity exists under the laws of the foreign national's own state). For implications of this law, see Jay A. Erstling, *The Semiconductor Chip Protection Act and Its Impact on the International Protection of Chip Designs*, 15 *Rutgers Computer & Tech. L.J.* 303 (1989); Charles R. McManis, *International Protection for Semiconductor Chip Designs and the Standard of Judicial Review of Presidential Proclamations Issued Pursuant to the Semiconductor Chip Protection Act of 1984*, 22 *Geo. Wash. J. Int'l L. & Econ.* 331 (1988).

246. See supra text accompanying notes 147-149, 203-217.

247. See, e.g., Randall Davis, *Intellectual Property and Software: The Assumptions Are Broken*, in *World Intellectual Property Organization, World Wide Symposium on the Intellectual Property Aspects of Artificial Intelligence* 77-84 (1991) [hereinafter *WIPO Symposium on Artificial Intelligence*]; Randall Davis, *The Nature of Software and Its Consequences for Establishing and Evaluating Similarity*, 5 *Software L.J.* 299, 301, 312-13 (1992); Dennis S. Karjala, *Copyright, Computer Software, and the New Protectionism*, 28 *Jurimetrics J.* 33, 38 (1987); Samuelson, supra note 50, at 673; Manifesto, supra note 61, at 2316-17.

ent law elicits careful judicial attention in all developed copyright systems.²⁴⁸ Nevertheless, few of these low-authorship factual and functional works became embodied in products sold on the general products market, as industrial designs always have. In my earlier work, I outlined the historical solutions adopted to deal with these low-authorship works and their implications for computer programs.²⁴⁹ This research has shown that computer programs represent a troubling new subcategory of "applied" or industrial literature, one that recreates the problems associated with industrial art, including the "two-market conundrum" once inapplicable to low-authorship literary works.

(i) *A Sui Generis French Law.* — Authorities in many developed countries recognized the dangers of overprotecting this new field and identified computer programs early on with other borderline subject matters requiring tailored legal treatment. With the blessings of the leading American producer, for example, the World Intellectual Property Organization developed a model sui generis law for computer programs, which built on modified copyright principles and also bore some affinities to utility model regimes.²⁵⁰ In Germany, judicial identification of computer programs with engineering projects and similar productions relegated the protection of routine computer programs to the misappropriation branch of unfair competition law, despite scholarly and legislative pressures to analogize computer software to scientific works and low-authorship functional works in general.²⁵¹

Importantly, in France, where a confidential government study had warned of the likely dangers from ignoring the industrial character of

248. See, e.g., *Baker v. Selden*, 101 U.S. 99, 102-03 (1879); 2 Goldstein, *supra* note 72, §§ 8.5-8.5.2.2.

249. See Reichman, *Information Law*, *supra* note 62, at 343-44.

250. See WIPO Model Provisions Concerning Computer Programs of 1977, 14 Copyright 6 (1978); see also Galbi, *supra* note 55, at 280-81 (proposal for sui generis approach developed by IBM's senior patent attorney); Elmer W. Galbi, *The Unpatentability of Computer Programs*, 5 Patent Law Annual 147-83 (1967). See generally Thomas Dreier, *The International Development of Copyright Protection for Computer Programs*, in *A Handbook of European Software Law* 217-19 (Michael Lehmann & Colin Tapper eds., 1993). In Japan, the Ministry of International Trade and Industry (MITI) strongly supported a sui generis approach, but the Cultural Affairs Ministry (CAA) advocated a copyright approach. See, e.g., Dreier, *supra*, at 221; Dennis Karjala, *Protection of Computer Programs Under Japanese Copyright Law*, 4 Eur. Intell. Prop. Rev. 105 (1986).

251. See Michael Lehmann, *The Legal Protection of Computer Programs in Germany: A Summary of the Present Situation*, 19 Int'l Rev. Indus. Prop. & Copyright L. 473, 474-76 (1988); Ulrich Lowenheim, *Protection for Computer Programs in West Germany*, 4 High Tech. L.J. 187 (1989); cf. Judgment of May 9, 1985 (*Sudwestdeutsche Inkasso Kb. v. Bappert und Burkert Computer GmbH*), BGH (Federal Supreme Court), 1985 G.R.U.R. 1041, 17 Int'l Rev. Indus. Prop. & Copyright L. 681, 688 (F.R.G. 1985).

computer programs,²⁵² a *sui generis* regime built on modified copyright principles became law as an attachment to the Copyright Law of 1985.²⁵³ Although formally recognizing computer programs as copyrightable works,²⁵⁴ the French law explicitly excepted computer programs from many general principles of copyright law, effectively establishing a *sui generis* regime.²⁵⁵

One departure from the copyright regime was the twenty-five-year period of protection under French law.²⁵⁶ Justified in terms of the industrial character of computer programs,²⁵⁷ the law thus appealed by analogy to the treatment afforded works of applied art under Article 7(4) of the Berne Convention.²⁵⁸ It also strengthened employers' rights against both employees and specially commissioned programmers, and it curtailed some of the creators' moral rights.²⁵⁹ Above all, Article 47 of the Copyright Law of 1985 conferred an exclusive right to control all unauthorized uses of a computer program, in addition to the rights of reproduction and public performance.²⁶⁰ This provision introduced a new patent-like monopoly into literary and artistic property law.²⁶¹ In so doing, however, the drafters omitted all the formal and substantive prerequisites of industrial property laws—notably the novelty and registration

252. Cf. *Señat-Rapport Jolibois*, August, 1985, at 46–56, "Titre Additionnel Après le Titre IV des Logiciels" (echoing conclusions of unpublished INPI study and concluding that protection of investors mandates an "industrial approach" to this question).

253. *Loi no. 85-660, du 3 juillet 1985 relative aux droits des auteurs et aux droits des artistes-interprètes, des producteurs de phonogrammes et de vidéogrammes et des entreprises de communication audiovisuelle*, Titre V, arts. 45–51 (Des Logiciels) [computer programs], 1985 *Journal Officiel de la République Française* [J.O.] 7495, 7499 [hereinafter *French Copyright Law of July 3, 1985*] (codified in scattered sections of the *Code de la Propriété Intellectuelle* [hereinafter *French Intellectual Property Code*]); André Lucas, *Le Droit de L'Informatique* 183–262 (1987); see also Philippe Gaudrat, *La protection des logiciels par le droit d'auteur*, 138 *R.I.D.A.* 77, 130–32 (1988).

254. See Lucas, *supra* note 253, at 214.

255. See *id.* at 214–44.

256. See *French Copyright Law of July 3, 1985*, *supra* note 253, art. 48; André Lucas, France, in 1 Paul E. Geller, *International Copyright Law and Practice* § 2[4][d], § 3[2][b] (Paul E. Geller ed., rev. ed. 1993) (noting inconsistency with EC Software Directive of 1991, *infra* note 261, arts. 7–8, which require a minimum term of fifty years).

257. See Lucas, *supra* note 253, at 244 & n.204.

258. See *Berne Convention*, *supra* note 4, art. 7(4), S. Treaty Doc. No. 99-27, at 42 (requiring minimum of 25 years of protection for works of applied art); Lucas, *supra* note 253, at 244–45.

259. See *French Copyright Law of July 3, 1985*, *supra* note 253, arts. 45–46.

260. See *id.* art. 47.

261. See, e.g., Lucas, *supra* note 253, at 248–51. But see Council Directive 91/250 of 14 May 1991 on the Legal Protection of Computer Programs, 1991 O.J. (L 122) 42 (requiring an analytical use exception and a decompilation exception to this right) [hereinafter *EC Software Directive*]; Lucas, *supra* note 256, § 8[2][a][i][C] (discussing EC Software Directive).

requirements—that normally attenuate such monopolies in order to promote the public interest.²⁶²

Inattention to these and other scope of protection issues like those that emerged in the United States have undermined the effectiveness of the French law.²⁶³ Still, it constituted an important advance, if only because it assimilated computer programs with the treatment of applied art under the Berne Convention²⁶⁴ and thereby established the premise for recognizing a parallel category of “literature applied to industry.” In rejecting the “unity of literature” doctrine emanating from the United States since 1980,²⁶⁵ however, the French authorities swerved from their historical allegiance to the “unity of art” doctrine, which mandates full copyright protection of industrial art.²⁶⁶ This logical contradiction, inversely parallel to one that has plagued the United States authorities since 1980,²⁶⁷ typifies the incoherence that pervades the hybrid legal regimes under review.

Unfortunately, the European Community’s Directive on the Legal Protection of Computer Programs²⁶⁸ will override inconsistent provisions of the French law of 1985.²⁶⁹ Although the French law had the potential to teach valuable lessons regarding the current crisis, the opportunity to learn from this interesting experiment may be lost once the Directive is implemented.

(ii) *Limits of the “Unity of Literature” Approach.* — In the United States, the growth of the market for mass-produced computer software led copyright authorities to refine the “unity of literature” approach, first articulated in 1964, which justified full copyright protection of computer programs.²⁷⁰ When Congress implemented this approach in 1980, without

262. See generally Lucas, *supra* note 253, at 218–21.

263. Cf. Peter S. Menell, *An Analysis of the Scope of Copyright Protection for Application Programs*, 41 *Stan. L. Rev.* 1045, 1071–77 (1989); Reichman, *Electronic Information Tools*, *supra* note 48, at 456–68; Pamela Samuelson, *Computer Programs, User Interfaces, and Section 102(b) of the Copyright Act of 1976: A Critique of Lotus v. Paperback*, 55 *Law & Contemp. Probs.* 311, 322–23, 325–31, 346–52 (1992).

264. See *supra* note 258 and accompanying text.

265. See *infra* text accompanying notes 270–280.

266. See *supra* notes 122, 125 and accompanying text.

267. In effect, the French law repaid the United States for its historical opposition to the “unity of art” gospel preached by France, which justifies copyright protection of industrial designs. Both sides seem blissfully unaware of the logical contradictions inherent in advocating different modalities of protection for industrial art and industrial literature. See Reichman, *The United States Experience*, *supra* note 44, at 148–149.

268. See EC Software Directive, *supra* note 261, arts. 5, 6, 8.

269. See, e.g., André Lucas, *The Council Directive of 14 May 1991 Concerning the Legal Protection of Computer Programs and Its Implications in French Law*, 14 *Eur. Intell. Prop. Rev.* 28, 31 (1992).

270. See, e.g., George D. Cary, *Copyright Registration and Computer Programs*, 11 *Bull. Copyright Soc’y* 362 (1964); Michael S. Keplinger, *Authorship in the Information Age: Protection for Computer Programs Under the Berne and Universal Copyright*

serious inquiry into the technical properties of computer programs,²⁷¹ it sanctioned two contradictory sets of provisions concerning the eligibility of industrial art and literature. At one extreme, Congress rejected the "unity of art" heresy brewing in the courts and legal literature,²⁷² and it codified a test of artistic separability that effectively denied copyright protection to most three-dimensional modern designs of useful articles.²⁷³ At the opposite extreme, Congress codified full copyright protection of computer programs without carrying over any of the doctrinal limitations, including the criterion of separability, that it had imposed on applied art.²⁷⁴

In effect, these contradictory dispositions relegated industrial art to free competition in the open market²⁷⁵ while endowing industrial literature—that is, special-purpose machine tools cast in digital form²⁷⁶—with the generous modalities and long term of protection heretofore confined to the specialized market for literary and artistic works.²⁷⁷ A decade later, the European Community, bowing to pressure from the United States, produced the Council Directive on Computer Programs,²⁷⁸ which adopts

Conventions, 21 Copyright 119, 1240–28 (1985). See generally CONTU Final Report, *supra* note 39, at 9–26.

271. See Software Protection Act of 1980, Pub. L. No. 96-517, Section 10(b), 94 Stat. 3015, 3028 (codified as amended at 17 U.S.C. Sections 101, 117 (1988)). Congress held no hearings on the Software Amendment and merely implemented the CONTU recommendations with minor changes. However, CONTU had never conducted a serious inquiry into the technical properties of computer programs. See, e.g., CONTU Final Report, *supra* note 39, at 9–26; Manifesto, *supra* note 61, at TAN 54.

272. See, e.g., *Esquire, Inc. v. Ringer*, 414 F. Supp. 939 (D.D.C. 1976), *rev'd*, 591 F.2d 796 (D.C. Cir. 1978), *cert. denied*, 440 U.S. 908 (1979); 1 Melville B. Nimmer & David Nimmer, *Nimmer on Copyright* § 2.08[B][3] (rev. ed. 1994) [hereinafter *Nimmer*]; Reichman, *Designs Before 1976*, *supra* note 127, at 1238–49.

273. See 17 U.S.C. § 101 (1988).

274. See 17 U.S.C. § 101 (1988) (definitions of "literary works," "useful article," and, after 1980, "computer program"). The crucial provision in 17 U.S.C. § 113(b), which excluded useful articles portrayed in technical drawings and blueprints, did not expressly apply to *verbal* blueprints, such as source codes, because these conveyed information and did not portray useful articles. See, e.g., Reichman, *The United States Experience*, *supra* note 44, at 58–61. But see 17 U.S.C. § 102(b) (1988) (excluding ideas, methods, principles, and processes); J.H. Reichman, *Computer Programs as Applied Scientific Know-How: Implications of Copyright Protection for Commercialized University Research*, 42 *Vand. L. Rev.* 639, 692–93 & n.288 (1989) [hereinafter *Reichman, Programs as Know-How*] (demonstrating that *Baker v. Selden* applies the same limitations on verbal blueprints as on graphic blueprints covered by § 113(b), which is merely a partial codification of the holding in that case).

275. However, the federal appellate courts have increasingly frustrated this project in the name of unfair competition. See *supra* notes 142, 146 and accompanying text.

276. See Manifesto, *supra* note 61, at 2316.

277. See *supra* text accompanying notes 86–87.

278. For a discussion of the pressures for strong protection exerted by the bigger American firms and counterpressures brought to bear by a coalition of smaller American and European firms, see T. Vinje, *The Legislative History of the EC Software Directive*, in *Handbook of European Software Law*, *supra* note 250, at 45–47; Linda G. Morrisson, *The*

a copyright approach while subtly incorporating important tailor-made exceptions and limitations.²⁷⁹ Further pressure on the developing countries, especially the threat of trade sanctions, then led to the recognition of computer programs as copyrightable literary works within the purview of the GATT/TRIPs Agreement.²⁸⁰

These legislative developments, which extend the generous modalities of the mature copyright paradigm to computer programs and other electronic information tools, broke with the historical decision to confine the protection of tool designs to the very different premises of industrial property law, especially the utility model laws discussed earlier in this study.²⁸¹ However, copyright law cannot satisfactorily mediate between the public and private interests.²⁸² In particular, the broad adaptation or derivative work right that copyright law bestows on true literary and artistic works²⁸³ conflicts with the narrow range of equivalents available for innovative tool designs under the traditional utility model laws²⁸⁴ and with time-honored rules that deny copyright protection for the technical results conveyed in scientific or functional works.²⁸⁵

To the extent that copyright courts defer to the border with industrial property law in software infringement cases, as was traditionally done for functional works, they will protect only external expressive features—especially code—against slavish imitation, more or less in the manner of a roving unfair competition law. This “thin copyright” tradition²⁸⁶ accounts in part for the inability of the domestic copyright law to protect the technical solutions embodied in integrated circuit designs during the late 1970s;²⁸⁷ parallel rules inhibited the Italian Supreme Court from allowing that country’s copyright law to protect the technical contents of

E.C. Directive on the Legal Protection of Computer Programs: Does it Leave Room for Reverse Engineering Beyond the Need for Interoperability?, 25 Vand. L. Rev. 293, 300–18 (1992).

279. See Michael Lehmann, The European Directive on the Protection of Computer Programs, in *A Handbook of European Software Law*, supra note 250, at 163–81; supra notes 261, 268–269 and accompanying text.

280. See, e.g., GATT/TRIPs, supra note 7, art. 10(1)–(2). See generally Reichman, TRIPs Component, supra note 7, at 173–78 (pressures on developing countries); id. at 224–25, 229–35 (functional works under GATT/TRIPs).

281. See supra notes 99–117 and accompanying text.

282. See generally Computer Science and Telecommunications Bd., Nat’l Research Council, Intellectual Property Issues in Software 43–93 (1991).

283. See 17 U.S.C. §§ 101, 103, 106(2) (1988); 2 Goldstein, supra note 72, §§ 7.4.1–7.4.2; William M. Landes & Richard A. Posner, An Economic Analysis of Copyright Law, 18 J. Legal Stud. 325, 354–55 (1989).

284. See supra note 113 and accompanying text.

285. See, e.g., 17 U.S.C. § 102(b) (1988); *Baker v. Selden*, 101 U.S. 99 (1879).

286. See *Feist Publications, Inc. v. Rural Tel. Serv. Co.*, 499 U.S. 340, 350 (1991); see also *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 159–64 (1989) (stressing competitors’ rights to reverse engineer unpatented, noncopyrightable product designs).

287. See supra text accompanying notes 228–231.

engineering projects in the 1930s.²⁸⁸ This tradition, however, often leaves unprotected the most commercially valuable data structures that determine the functional behavior of the program,²⁸⁹ and no hybrid regimes in any domestic intellectual property system currently protect unpatentable applications of programming know-how to specific industrial achievements.²⁹⁰

To the extent that courts nonetheless stretch copyright law to allow the copyright owner's derivative work right to protect functionally determined compilations and subcompilations of data structures in software infringement cases, they convert copyright law into a *de facto* utility model law, one that grotesquely provides patent-like protection on the softest possible conditions for the longest possible time.²⁹¹ Such gross overprotection suffocates the very incremental innovation that copyright law was intended to encourage.²⁹²

In practice, proponents of strong copyright protection for computer programs have thus far achieved a Pyrrhic victory. For example, several federal appeals court cases in the United States have narrowed the scope of program components that qualify for copyright protection.²⁹³ Still

288. See *Terranova v. Piacentini*, Italian Supreme Court, March 2, 1932, in 3 *Il Diritto di Autore* 118; see also Piola Caselli, *supra* note 226, at 510–11 (noting that *Terranova* gave rise to Article 99 of the Italian copyright law, which provides *sui generis* protection for novel technical solutions embodied in engineering projects).

289. See *infra* notes 293–294.

290. The German utility model law, as recently amended, see *supra* note 100 and accompanying text, extends to novel software innovation meeting a certain level of qualitative originality. Moreover, a pending decision to develop a directive on utility models for European Union member states could provide *sui generis* protection for functional components of user interfaces. See also the new unfair competition laws in Japan and Switzerland, described *supra* text accompanying notes 209–218.

291. See, e.g., *Whelan Assocs., Inc. v. Jaslow Dental Lab., Inc.*, 797 F.2d 1222, 1237–38 (3d Cir. 1986), cert. denied, 479 U.S. 1031 (1987); *Lotus Dev. Corp. v. Borland Int'l, Inc.*, 799 F. Supp. 203 (D. Mass. 1992); *Lotus Dev. Corp. v. Paperback Software Int'l*, 740 F. Supp. 37 (D. Mass. 1990). See generally, Samuelson, *supra* note 263. For express proposals to bring computer programs into utility model laws, see, e.g., Takahuru Higashima & Kenji Ushiku, *A New Means of International Protection of Computer Programs Through the Paris Convention—A New Concept of Utility Model*, 7 *Computer L.J.* 1, 10–12 (1986).

292. See, e.g., Menell, *supra* note 263, at 1082; Manifesto, *supra* note 61, at 2328–29. By persuading courts to overextend the exclusive right to prepare derivative works, owners of software copyrights can assert proprietary claims to subsequent innovations that exploit recognizable aggregates of the original data and instruction sets found in their programs, even though the matter claimed to have been infringed contains virtually no personal expression and fulfills purely functional objectives. See, e.g., Reichman, *Electronic Information Tools*, *supra* note 48, at 456–61.

293. See *Engineering Dynamics, Inc. v. Structural Software, Inc.*, 26 F.3d 1335 (5th Cir. 1994); *Gates Rubber Co. v. Bando Chem. Indus., Ltd.*, 9 F.3d 823 (10th Cir. 1993); *Computer Assocs., Int'l, Inc. v. Altai, Inc.*, 982 F.2d 693 (2d Cir. 1992); *Plains Cotton Coop. Ass'n v. Goodpasture Computer Serv.*, 807 F.2d 1256 (5th Cir. 1987). See generally Dennis S. Karjala, *Recent United States and International Developments in Software Protection* (pt. 2), 16 *Eur. Intell. Prop. Rev.* 13, 58–60 (1994).

other decisions now treat as fair use the making of intermediate copies of an originator's object code for purposes of reverse engineering noncopyrightable ideas or components that competitors cannot reasonably discover by other means, so long as these competitors independently create their own end products without embodying the originator's protectible expression.²⁹⁴

Copyright protection of computer programs in the United States still prevents the wholesale duplication of any given program, and especially its code, much like unfair competition law appears to do in Germany.²⁹⁵ But neither copyright nor trade secret laws prevent re-implementation of functionally equivalent behavior by proper means, nor will these laws impede second comers from using components that are functionally determined or that constitute either standards of efficiency in the trade or market-determined standards that consumers require.

Copyright protection of computer programs in the United States has thus relegated the commercially valuable know-how embodied in publicly distributed programs to a legal limbo.²⁹⁶ This, in turn, gives new life to the drive for patent protection of computer programs, with its ensuing tendencies to lower the nonobviousness standard and to distort other traditional patent principles.²⁹⁷ Whether European courts operating under domestic laws implementing the Council Directive on Computer Programs will reach results comparable to those emerging in the United States remains to be seen, but the most knowledgeable proponents of that Directive seem to have expected just this sort of "thin" protection all along.²⁹⁸ The TRIPs Agreement seems unlikely to change these trends because it merely institutionalizes internationally the same know-how gap that plagues the domestic intellectual property systems.²⁹⁹

294. See *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510 (9th Cir. 1992); *Atari Games Corp. v. Nintendo of America, Inc.*, 975 F.2d 832 (Fed. Cir. 1992); see also Donald S. Chisum et al., Last Frontier Conference Report on Copyright Protection of Computer Software, 30 *Jurimetrics* 15, 24-25 (1989); Reichman, Programs as Know-How, *supra* note 274, at 691-93, 693 n.288.

295. See *supra* text accompanying note 251.

296. See, e.g., Reichman, Overlapping Proprietary Rights, *supra* note 74, at 88-93.

297. See, e.g., Pamela Samuelson, *Benson* Revisited: The Case Against Patent Protection for Algorithms and Other Computer Program-Related Inventions, 39 *Emory L.J.* 1025 (1990); Manifesto, *supra* note 61 at 2343-47, 2361-64. But see Donald S. Chisum, The Patentability of Algorithms, 47 *U. Pitt. L. Rev.* 959 (1986).

298. See, e.g., Lehmann, *supra* note 279, at 167-68, 172-73, 177-81; see also Michael Sucker, The Software Directive—Between the Combat Against Piracy and the Preservation of Undistorted Competition, in *A Handbook of European Software Law*, *supra* note 249, at 11, 13; Anne Wilkinson, Software Protection, Trade, and Industrial Policies in the European Community, in *A Handbook of European Software Law*, *supra* note 249, at 25, 28-29. Ironically, large American interests spent millions of dollars (if not more) "persuading" the European officials to provide the very weak form of protection that these officials desired from the start.

299. See Reichman, Beyond the Historical Lines, *supra* note 18, at 113-15.

Copyright protection of industrial literature thus represents a short-sighted solution that seems likely to trigger the same cycles of over- and underprotection that characterize the history of industrial art.³⁰⁰ An effective long-term solution will require a different kind of intellectual property regime, one capable of protecting industrial applications of technical and scientific know-how without succumbing to the economic distortions of the exclusive property rights models. The companion Article, *A Manifesto Concerning the Legal Protection of Computer Programs*, examines these matters at length.³⁰¹

d. *Applied Art and Industrial Designs*. — Works of applied art pose the same problems for copyright law as noncopyrightable industrial designs pose for the patent regime.³⁰² The responses to these problems have been no less drastic. The willingness of some British and French courts to allow purely functional designs to obtain the full measure of protection otherwise afforded artistic works in copyright law was an even more radical step than the three hybrid regimes discussed above.³⁰³

Between 1968 and 1989, the United Kingdom protected aesthetic designs under either the Registered Designs Act of 1949, which operated on patent principles, or under a terminable copyright lasting fifteen years, which was triggered if the proprietor commercially exploited three-dimensional embodiments derived from either a two-dimensional drawing of the design or from a true sculptural work.³⁰⁴ The apparently harmless purpose of this "terminable copyright" was to forestall the copying of appearance designs that might have qualified for protection under the Registered Designs Act of 1949 during the often lengthy period between application and the formal grant of exclusive design rights.³⁰⁵ However, this legal framework left functional designs unprotected (unless entitled to full patent protection), because the United Kingdom did not possess a utility model law; its registered design law excluded functionally determined designs; and it did not recognize slavish imitation as a business tort in the absence of confusion.³⁰⁶ Courts responded to this perceived lacuna by invoking the principle of nondiscrimination in order to afford

300. See *supra* text accompanying notes 143–144.

301. See *Manifesto*, *supra* note 61.

302. See *supra* text accompanying note 118–125; *infra* note 431.

303. See *supra* text accompanying notes 99–151.

304. See, e.g., W.R. Cornish, *Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights* 190–91 (2d ed. 1989); Fellner, *supra* note 148, at 371. An amendment to the United Kingdom's copyright law in 1968 had established that purely aesthetic designs, especially jewelry designs, might obtain immediate protection in copyright law as two-dimensional drawings, but that the term of protection would then shrink to fifteen years from the date of first marketing for any three-dimensional embodiments of these designs that were later commercially exploited. See Copyright Act, 1956, 4 & 5 Eliz. 2, ch. 74, §§ 3(1), 10(3) (as amended by Design Copyright Act of 1968, 48(1)); Fellner, *supra* note 148, at 373–75.

305. See, e.g., Fellner, *supra* note 148, at 372.

306. See Cornish, *supra* note 304, at 306–07.

copyright protection to three-dimensional functional designs that were nominally derived from two-dimensional engineering drawings or blueprints. Under the strained interpretation of the statute used for this purpose, three-dimensional embodiments of two-dimensional functional designs were not subject to the "terminable copyright" of 1968, and therefore qualified for the full life-plus-fifty-year term given to artistic works.³⁰⁷

Between 1968 and 1988, British courts thus protected a "host of wholly functional, nonregistrable articles designed without regard to appearance" on a par with true literary and artistic works merely "because they started life as engineering drawings, because copying could be indirect as well as direct, and because it could be done by reproducing a two-dimensional work (the plaintiff's drawing) in three-dimensional form."³⁰⁸ Items protected in this manner included screws, bolts, washers, clerical collars, paper-mache bedpans, pulley wheels, and plastic knock-down drawers.³⁰⁹

Similar misapplications of the domestic copyright laws to purely functional objects had occurred under the "unity of art" doctrine in Belgium before 1975,³¹⁰ and still occur in France.³¹¹ As previously observed, the unity of art doctrine allows any appearance design to obtain cumulative protection as "works of art" in copyright law regardless of its status under the design protection law in force.³¹² By combining a boundless definition of "art" with exaggerated deference to the principle of nondiscrimination, French courts have conferred full copyright protection on purely functional designs of all kinds, including the designs of plastic salad bowls, stair wells, door hinges, light sockets, luggage racks, hair brushes, hospital carts, and the hexagonal shape of a grease gun for lubricating automobiles.³¹³

As I have previously shown, the extension of full copyright protection to wholly functional product designs is the most anomalous of all the

307. See, e.g., Fellner, *supra* note 148, at 375. Ironically, this strained interpretation was probably never intended by Parliament, see, e.g., Fellner, *supra*, at 369, 372-74, which, however, had neglected to include in the 1968 Amendment introducing a "terminable copyright," see *supra* note 304, an express condition denying copyright protection for purely functional objects initially portrayed in two-dimensional form. Cf. 17 U.S.C. 113(b) (1988) (codifying in part *Baker v. Selden*).

308. See Fellner, *supra* note 148, at 373.

309. See *id.* (citing authorities).

310. See, e.g., Reichman, *Designs After 1976*, *supra* note 122, at 283-88. Since Belgium had no *sui generis* design law prior to 1975, that country carried the unity of art thesis to its most extreme lengths. This, in turn, helped to spark the international movement to modernize the *sui generis* design laws, which ultimately cut back on Belgian copyright law. See *id.* at 283-97 (citing authorities).

311. See, e.g., Pérot-Morel, *supra* note 74, at 121.

312. See *supra* notes 122, 266 and accompanying text.

313. See, e.g., Pérot-Morel, *supra* note 74, at 120-22; see also Marie-Angèle Pérot-Morel, *Protection of Designs and How It Is Related to the Law on Patents in French Law*, in *Design Protection*, *supra* note 97, at 67-78.

mutants reviewed in this survey. Yet, the reason that the United Kingdom, in particular, lacks an unfair competition law to perform similar functions is that it formally subscribes to strict free-market principles in accordance with which product simulation is a right rather than a wrong.³¹⁴ The use of copyright law to close this antipiracy gap is thus both hypocritical and economically counterproductive since copyright law cuts back on free competition even more than a general purpose misappropriation law need do.³¹⁵

In 1986, a House of Lords decision that exempted automobile spare parts from the United Kingdom's copyright law cast doubt on the continued efficacy of protecting functional designs in this fashion.³¹⁶ The United Kingdom's unregistered design right of 1988 ended the protection of functional designs in copyright law altogether. This unregistered design right, which provides a maximum fifteen years of protection for both functional and aesthetic designs on modified copyright principles, influenced early versions of the European Community's Proposal for a Council Directive on the legal protection of designs.³¹⁷ If adopted, this Directive, in time, could persuade the French authorities to eliminate some, if not all, of the excesses of its current copyright approach.³¹⁸

Even so, the unregistered design right, which could burden virtually every product sold on the general products market with exclusive intellectual property rights, raises troubling new questions that sectoral lobbying prefers to minimize.³¹⁹ These measures merely add to the number of ad hoc initiatives without addressing the need for a sound response to the protectionist challenge of the legal hybrids as a group.

e. Factual Compilations and Electronic Databases. — The suitability of copyright protection for low-authorship factual works raises serious questions. All acknowledge the need to stop copyists from too easily free-riding on the work of others.³²⁰ By the same token, these works often fail to exhibit the *sine qua non* of copyrightable subject matter: creative expression.³²¹

314. See, e.g., Cornish, *supra* note 304, at 306–07; Brown, *supra* note 25, at 1357–58.

315. See *supra* text accompanying notes 86, 122–123; see also *supra* notes 209–218 and accompanying text.

316. See *British Leyland Motor Corp. v. Armstrong Patents Co.*, 1986 F.S.R. 221, 1986 R.P.C. 279 (House of Lords); see also Fellner, *supra* note 148, at 374–77.

317. See Proposed EC Design Directive, *supra* note 150.

318. See, e.g., EC Explanatory Memorandum on Designs, *supra* note 118, at 90–91 (requiring harmonization between states at international level but allowing variations in local law).

319. Cf. Reichman, *Evolution*, *supra* note 143.

320. See, e.g., Robert C. Denicola, *Copyright in Collections of Facts: A Theory for the Protection of Nonfiction Literary Works*, 81 *Colum.L. Rev.* 516, 530–31 (1981) (advocating sweat-of-the-brow theory of copyright protection for compilations and databases in pre-*Feist* U.S. law).

321. See, e.g., Jane C. Ginsburg, *Creation and Commercial Value: Copyright Protection of Works of Information*, 90 *Colum. L. Rev.* 1865, 1907–10 (1990) (citing

While the solutions differ by jurisdiction (and sometimes within one jurisdiction), most factual compilations receive protection under domestic copyright laws by some means, but only "thin" protection against slavish or wholesale duplication.³²² Domestic, foreign, and to some extent, international copyright laws thus recognize compilations of information that constitute original works of authorship or intellectual creations as copyrightable subject matter.³²³

Even under this approach, however, eligibility in copyright law arguably attaches to original, creative selections and arrangements of the data compiled, but not to commonplace, comprehensive, or functionally determined selections and arrangements that leave little room for choice or other indicia of creative authorship.³²⁴ Although a modicum of quantitative creativity suffices for copyright protection of factual works in most jurisdictions today,³²⁵ this requirement could still prove too stringent for electronic information tools that process and store information automatically. If so, it would exclude many of the most commercially and scientifically important databases from both the domestic and international copyright systems.³²⁶

authorities); L. Ray Patterson & Craig Joyce, *Monopolizing the Law: The Scope of Copyright Protection for Law Reports and Statutory Compilations*, 36 *UCLA L. Rev.* 719, 728-31 (1989).

322. See, e.g., Frank Gotzen, *Grand orientations du droit d'auteur dans les Etats membres de la C.E.E. en matière de banque de données* in *Banques de Données et Droit di Auteur* 86-98 (I.R.P.I. ed., 1986); André Lucas, *General Report—Data Bases and Copyright*, in *L'Informatique et le Droit de L'Auteur* 332, 333-36 (proceedings of the ALAI Annual Congress, Quebec, Canada, Sept. 26-30, 1989); see also Paul Katzenberger, *Copyright Law and Data Banks*, 21 *Int'l Rev. Indus. Prop. & Copyright L.* 310, 322-26 (1990); Takashi Yuasa, *Computer Data Base Protection: The Impact of Japanese Legislative Developments on United States and Japanese Copyright Laws*, 9 *Fordham Int'l L.J.* 191, 196-203 (1985-1986). For the defective logic of these makeshift solutions in the U.S., see Patterson & Joyce, *supra* note 321, at 719, 729.

323. See, e.g., 17 U.S.C. §§ 101, 103(a)-(b) (1988); *supra* note 322 and accompanying text; see also Berne Convention, *supra* note 4, art. 2(3), S. Treaty Doc. No. 99-27, at 39, which protects "collections." The extent to which this includes compilations is ambiguous. See, e.g., Ricketson, *supra* note 6, at 298-303. GATT/TRIPs, *supra* note 7, art. 10, requires signatories to protect compilations of data that "constitute intellectual creations," but does nothing to resolve the pre-existing ambiguities. See, e.g., Reichman, *TRIPs Component*, *supra* note 7, at 224-29.

324. See, e.g., 2 Goldstein, *supra* note 72, § 8.4; Robert A. Gorman, *Fact or Fancy? The Implications for Copyright*, 29 *J. Copyright Soc'y* 560 (1980).

325. See, e.g., Reichman, *Realist's Approach*, *supra* note 85, at 949-55.

326. See, e.g., Commission of the European Communities, *Explanatory Memorandum to the Proposal for a Council Directive on the Legal Protection of Databases* (COM (92) 24 final—SYN 393) 5-11, 13-26 (1992) [hereinafter *First Explanatory Memorandum Concerning EC Database Directive*] ("the type of collection foreseen in article 2.5 of the Berne Convention is not in every respect the same activity as the compiling of data in an on-line real-time data base"); see also Office of Technology Assessment, *U.S. Congress, Intellectual Property Rights in an Age of Electronics and Information* 252-53 (1986).

Moreover, proprietors who overcome these subject matter and eligibility hurdles often find the scope of protection afforded a particular selection and arrangement too narrow to meet their needs. Traditional copyright principles applicable to factual works allow third parties freely to use the disparate facts organized within the framework of a particular selection and arrangement.³²⁷ These principles expose even proprietors of copyrighted compilations to the risk that second comers will appropriate the fruits of their investment of time, money, and skill, unless courts strain traditional doctrine to protect the compiler's contribution as such.³²⁸

The United States Supreme Court decision, *Feist Publications, Inc. v. Rural Telephone Services Co.*,³²⁹ illustrates these tensions. The Court held that compilations of data built on routine, commonplace, or necessary criteria of selection and arrangement do not constitute "original works of authorship" under Section 102(a) of the 1976 Copyright Act.³³⁰ Thus literary productions resulting from merely "sweat of the brow" labor and effort are unprotected; only "creative authorship" satisfies the constitutional enabling clause governing copyrights and patents.³³¹ In so doing, the Court approved the "thin" copyright doctrine traditionally applied to both factual and functional works and disavowed a line of cases in one jurisdiction that had prevented third parties from exploiting the disparate facts assembled in otherwise copyrightable compilations.³³²

(i) *The Nordic Catalogue Rule.* — The dilemma that low-authorship factual works poses for copyright law has kindled new interest in early efforts by the Nordic countries to protect similar productions under sui generis laws without apparently negating full copyright protection of more creative compilations.³³³ The Nordic "catalogue rule," as it is known, provides short-term copyright-like protection for noncopyrightable compilations. These laws prohibit slavish reproduction, in whole or

327. See, e.g., 2 Goldstein, *supra* note 72, § 8.4; Reichman, *Realist's Approach*, *supra* note 85, at 966–70 (citing conflicting lines of cases prior to *Feist*).

328. See, e.g., First Explanatory Memorandum Concerning EC Database Directive, *supra* note 326, at 24–26; see also Karjala, *Copyright and Misappropriation*, *supra* note 223; L. Ray Patterson, *Copyright Overextended: A Preliminary Inquiry Into the Needs for a Federal Statute of Unfair Competition*, 17 U. Dayton L. Rev. 385 (1982).

329. 499 U.S. 340 (1991).

330. See 17 U.S.C. § 102(a) (1988); *Feist*, 499 U.S. at 355.

331. See, e.g., Howard B. Abrams, *Originality and Creativity in Copyright Law*, 55 L. & Contemp. Probs. 3, 14–33 (1992) (discussing later cases applying *Feist*); Paul J. Heald, *The Vices of Originality*, 1991 Sup. Ct. Rev. 143, 145.

332. See *Feist*, 499 U.S. at 349–61 (allowing third-party use of data in white pages of telephone directory); see also *Bellsouth Advertising & Publishing Corp. v. Donnelly Info. Publishing, Inc.*, 999 F.2d 1436, 1443–46 (11th Cir. 1993); Jane C. Ginsburg, *No "Sweat?" Copyright and Other Protection of Information After Feist v. Rural Telephone*, 92 Colum. L. Rev. 338, 343–53 (1992); Robert A. Gorman, *The Feist Case: Reflections on a Pathbreaking Copyright Decision*, 18 Rutgers Computer & Tech. L.J. 731 (1992).

333. See, e.g., Gunnar Karnell, *The Nordic Catalogue Rule*, in *Protecting Works of Fact* 67–72 (E.J. Dommering & P.B. Hugenholtz eds., 1991).

in part, of "catalogues, tables, and similar compilations in which a large number of particulars have been summarized," including databases, for ten years after first publication.³³⁴ According to Professor Karnell, industrious effort and investment rather than creativity are the prerequisites under this neighboring rights regime.³³⁵

The Nordic catalogue rule is of particular interest for successfully reducing the pressures on copyright laws to absorb low-authorship works that otherwise lack protection against commercial piracy. This problem is especially evident in Sweden, for example, whose unfair competition laws do not recognize imitation as a tort in the absence of confusion.³³⁶ However, the Nordic catalogue rule pre-dates the digital revolution and reportedly fails to address the specific concerns that electronic information tools have raised. For example, the extent to which third parties can independently compile a similar production during the term of protection is reportedly unsettled,³³⁷ although a judicial failure to permit independent creation could result in indirect protection of organizing principles, methods, or ideas. A closer question is the extent to which third parties can use recognizable segments of the first compilation, especially disparate facts as such, in preparing a different compilation of their own.³³⁸

(ii) *An Extraction Right on Pseudo-Liability Principles.* — In contrast, the Commission of the European Communities has proposed an innovative Directive on the Legal Protection of Databases,³³⁹ loosely modelled on the Nordic catalogue rule, that more directly and strongly protects electronic information tools.³⁴⁰ This Directive is consistent with the Commission's ongoing efforts to harmonize the copyright laws of the European Union.³⁴¹ It received added impetus from *Feist* in the United States, which confirmed European fears that traditional copyright princi-

334. See Karnell, *supra* note 333, at 67–68 (quoting § 49 of the Swedish Copyright Act of 1960).

335. See *id.* at 70; cf. Denicola, *supra* note 320, at 531 (proposing compiler's copyright based on industrious effort).

336. See Karnell, *supra* note 333, at 70.

337. See *id.* at 71.

338. See *id.* at 70–71.

339. See Commission of the European Communities, Proposal for a Council Directive on the Legal Protection of Databases (COM (92) 24 final—SYN 393) 58–74 (1992) [hereinafter First EC Directive on Databases]; see also Commission of the European Communities, Amended Proposal for a Council Directive on the Legal Protection of Databases (COM (93) 464 final—SYN 393) (1993) [hereinafter Amended EC Directive on Databases].

340. See, e.g., Jean Hughes & Elizabeth Weightman, E.C. Database Protection: Fine Tuning the Commission's Proposal, 14 *Eur. Intell. Prop. Rev.* 147, 148 (1992) (Directive goes beyond the Nordic rule and protects against re-use of the information compiled).

341. See Commission of the European Communities, Green Paper on Copyright and the Challenge of Technology (COM (88) 172 final) 215 (1988).

ples would leave electronic databases underprotected at a time when their development was of great economic importance for the Union.³⁴²

The proposed Directive on Databases adopts a two-tiered approach that seeks to harmonize the requirements for copyrightable compilations in general and to establish a new regime for noncopyrightable electronic databases in particular.³⁴³ While copyright protection continues to turn on an original and creative selection or arrangement of factual or other material, the *sui generis* regime applies to the noncopyrightable contents of databases that are arranged, stored, and accessed by electronic means.³⁴⁴ As to these contents, the drafters of the Directive recognized the need to protect the compiler's industrious effort and investment against parasitic appropriation by competitors.³⁴⁵ Unfortunately, this innovative opening to liability principles was not consistently followed through, and the drafters have increasingly added contradictory elements drawn from exclusive rights models to the latest proposals.³⁴⁶

The Directive, as first proposed, guaranteed the maker of a noncopyrightable electronic database the right to prevent unauthorized, for-profit extraction or re-utilization of its factual contents, in whole or in substantial part,³⁴⁷ for at least ten years after creation of the database.³⁴⁸ The Communities' extraction right is thus stronger than analogous rights

342. See, e.g., First Explanatory Memorandum Concerning EC Database Directive, *supra* note 326, at 3, 16–18; Simon Chalton, *The Amended Database Directive Proposal: A Commentary and Synopsis*, 16 *Eur. Intell. Prop. Rev.* 94 (1994).

343. See, e.g., First Explanatory Memorandum Concerning EC Database Directive, *supra* note 326, at 34–36; First EC Directive on Databases, *supra* note 339, art. 2 (requiring copyright protection for original databases whose selection or arrangement constitute “intellectual creations,” and a *sui generis* extraction right against unauthorized extraction or re-utilization of the noncopyrightable contents of an electronic database); see also Amended EC Directive on Databases, *supra* note 339, arts. 1(1), 10(2). However, this framework deliberately leaves the noncopyrightable contents of nonelectronic databases and other compilations in limbo, and states are not required to take any action as to them. See, e.g., Chalton, *supra* note 342, at 95–96.

344. See, e.g., First Explanatory Memorandum Concerning EC Database Directive, *supra* note 326, at 21–22; Amended EC Directive on Databases, *supra* note 339, arts. 2.2, 6.

345. See, e.g., First Explanatory Memorandum Concerning EC Database Directive, *supra* note 326, at 25, 54; First EC Directive on Databases, *supra* note 339, art. 2(5).

346. Compare First Explanatory Memorandum Concerning EC Database Directive, *supra* note 326, at 25, 35, 41 (stressing goal of curbing parasitic behavior and misappropriation that undermines investment in data processing) with *id.* at 53 (stressing “exclusive right to prevent unauthorized extraction and reutilization” of contents). See also Amended EC Directive on Databases, *supra* note 339, art. 11(8)(a)–(b) (limiting users' rights so as “not to prejudice the exclusive rights” of the database owner “to exploit the database”).

347. See First EC Directive on Databases, *supra* note 339, arts. 1(1), 2(5). The extraction right does “not apply to the contents of a database where these are works already protected by copyright or neighboring rights.” Amended EC Directive on Databases, *supra* note 339, art. 10(2).

348. See First EC Directive on Databases, *supra* note 339, art. 9(3). Technically the right arises with creation of the database and lapses ten (now fifteen) years from the date it is first lawfully made available to the public.

under the Nordic catalogue rules³⁴⁹ in that the former clearly outlaws unauthorized re-use of the compiler's factual contents. The proposed Directive also recognized that a compiler who had substantially changed the contents of an electronic database could extend the extraction right beyond its initial term, but it was not clear that compilers might routinely expect to acquire such extensions.³⁵⁰ Recent amendments increase the initial period to fifteen years and track it from its first availability to the public or from the date of any substantial change to the database.³⁵¹ Thus, any publisher whose regular updates result in substantial modifications of all or even a significant part of the factual contents at least once every fifteen years may look forward to perpetual protection.³⁵²

To counterbalance its *sui generis* extraction right, the Commission of the European Communities has built a set of users' rights into the draft Directive, along with certain measures to defend the public interest in free competition. For example, users who lawfully obtained access to an electronic database were, in principle, always entitled to use the contents for their own private purposes,³⁵³ although no broad exception for educational or research uses was contemplated.³⁵⁴ The drafters envisioned that lawful users of an electronic database could even make a limited re-use of its contents for commercial purposes if they properly acknowledged the source.³⁵⁵ But the amended Directive weakens these users' rights by stipulating that any commercial re-use of insubstantial parts of a noncopyrightable electronic database are "not to prejudice the exclusive rights of the owner . . . to exploit the database."³⁵⁶

Despite the contradictory presence of this exclusive rights language even in the first version of the proposed Directive, its drafters officially claimed to embrace pure liability principles that simply forbade wholesale copying of an electronic database for commercial purposes without ex-

349. See *supra* notes 333–338 and accompanying text.

350. See First EC Directive on Databases, *supra* note 339, art. 9(4).

351. See Amended EC Directive on Databases, *supra* note 339, art. 12(1)(a)–(b), 12(2)(a)–(b). The amendments clarify that a "substantial change" for purposes of extending the extraction right entails only "successive accumulation of insubstantial additions, deletions or alterations . . . resulting in a substantial modification to all or part of the [electronic] database." *Id.*

352. See Chalton, *supra* note 342, at 97.

353. See First Explanatory Memorandum Concerning EC Database Directive, *supra* note 326, at 35; First EC Directive on Databases, *supra* note 339, art. 8(5).

354. See Commission of the European Communities, Amended Proposal for a Council Directive on the Legal Protection of Databases, Explanatory Memorandum (COM (93) 464 final—SYN 393) 4 (1993) [hereinafter Second Explanatory Memorandum Concerning Database Directive] (declining to accept Parliamentary request for special exemptions in favor of education and research).

355. See First EC Directive on Databases, *supra* note 339, § 8(4); First Explanatory Memorandum Concerning EC Database Directive, *supra* note 326, at 36.

356. See Amended EC Directive on Databases, *supra* note 581, art. 11(8)(a)–(b) (placing burden of proof on user).

pending independent effort to collect and verify similar information.³⁵⁷ In keeping with this aim, the drafters see the public interest in free competition as primarily safeguarded by allowing free entry to every compiler willing and able to collect and verify the same information independently and at his or her own expense.³⁵⁸ In other words, the Directive seemingly intends to provide originators only with artificial lead time in which to recoup their investment but not to prevent independent creation in the manner of a patent.³⁵⁹ Moreover, to avoid erecting inadvertent barriers to entry, the Directive provides compulsory licenses whenever the database makers become the sole sources of the contents in publicly available, electronic databases or when the contents of such databases emanate from public bodies that benefit from a natural monopoly. In these cases, originators must grant licenses for the commercial re-exploitation of the information contained in the databases on fair and nondiscriminatory terms.³⁶⁰

Notwithstanding the Commission's laudable opening to liability principles in crafting the proposed Directive on electronic databases, the admixture of exclusive rights baggage under pressure from publishers has given rise to a legal monstrosity that will affect information industries in other countries including the United States.³⁶¹ In attempting to rescue database publishers ineligible for copyright protection from the perils of "parasitic" competition, the drafters endow them with perpetual exclusive rights to disembodied information and data structures but neglect to recreate analogues to the many exceptions and limitations that otherwise safeguard the public interest under copyright laws.³⁶² Neither the Commission's express provisions concerning second-sourcing nor its tacit appeal to the principle of reverse engineering adequately substitute for such safeguards. On the contrary, these provisions mask the potentially high costs of recreating established databases³⁶³ and other hidden barriers to entry that may confer exorbitant market power on first comers. In

357. See First Explanatory Memorandum Concerning EC Database Directive, *supra* note 326, at 35, 41.

358. See *id.* at 25, 28, 35. There was also a hint that independent effort could allow a second comer greater leeway in reusing some of the first compiler's factual matter; but, to the extent that such a loophole existed, the publishers succeeded in having it closed in the Amended Directive.

359. See First Explanatory Memorandum Concerning EC Database Directive, *supra* note 326, at 25, 51.

360. See First EC Directive on Databases, *supra* note 339, art. 8(1)-(2); Amended EC Directive on Databases, *supra* note 339, art. 11(1)-(2).

361. See, e.g., Amended EC Directive on Databases, *supra* note 339, art. 13 (imposing reciprocity on nonresident foreign database makers); Chalton, *supra* note 342, at 99 (noting that national treatment will apply to database copyright, but not to the extraction right).

362. See generally Reichman, *Electronic Information Tools*, *supra* note 48, at 461-62.

363. See, e.g., First Explanatory Memorandum Concerning EC Database Directive, *supra* note 326, at 51 (requiring second comers to collect their own data, rather than avail themselves of the compulsory license provisions, even when cost of collection is greater

this context, the Commission's faith in the goodness of unregulated contractual agreements is touching, indeed.³⁶⁴ In reality, the harsh conditions and high prices that electronic database publishers increasingly impose on users everywhere, including institutional users such as libraries and research organizations,³⁶⁵ have already alarmed the United States Office of Technology Assessment.³⁶⁶

While it is a truism that information becomes a commodity in an Information Age,³⁶⁷ the Commission errs when it analogizes electronic information tools to other forms of technological innovation for regulatory purposes,³⁶⁸ in part because there are different and far-reaching issues of public interest in the free flow of information that transcend innovation law as such.³⁶⁹ Because digitalization often restores the publishers' power to subordinate the use of disseminated information to the terms of two-party contractual agreements—a power temporarily lost with the advent of the printing press³⁷⁰—it increasingly enables electronic publishers to serve as their own collection societies, subject to no membership controls and no external regulation. The front-end gains to publishers under the extraction right may thus conceal the long-term social costs in diminished research and development capabilities at public and semipub-

than the cost of the compulsory license, including the case of "data obtained by the use of an earth observation satellite").

364. See *id.* at 30 (extolling contractual uses of on-line databases as exemplifying the goals of the Directives).

365. See Office of Technology Assessment, U.S. Congress, *Finding a Balance: Computer Software, Intellectual Property, and the Challenge of Technological Change* 166–79 (1992) [hereinafter *OTA Report 1992*] (noting high subscription fees, user charges, search-time charges, downloading fees, and document retrieval fees); Reichman, *Electronic Information Tools*, *supra* note 48, at 461–67.

366. For example, publishers may impose a "one at a time" use requirement that forbids networking by multiple users. In addition, they may contractually require librarians to waive privileges that copyright law otherwise affords and to limit users' access to copyrighted matter beyond what the fair use doctrine would require. Similarly, database publishers in the United States have tried to limit the resource-sharing practices of libraries, which otherwise rest on specific exemptions under domestic copyright law, because the publishers view this practice as one that reduces the market for information. The ability of libraries to enhance the data they receive contractually in order to augment users' efficiencies also remains unclear in the absence of contractual authorization. See, e.g., *OTA Report 1992*, *supra* note 365, at 177–79.

367. See, e.g., *First Explanatory Memorandum Concerning EC Database Directive*, *supra* note 326, at 5.

368. See, e.g., *id.*

369. Cf., e.g., Jessica Litman, *Copyright and Information Policy*, 55 *Law & Contemp. Probs.* 185, 187–89, 204–09 (1992) ("In our shortsighted accommodation of industry coalitions and political expediency, we are crafting the rules of an information society without considering whether that future is one in which we would actually like to live.").

370. Cf. *First Explanatory Memorandum Concerning EC Database Directive*, *supra* note 326, at 3 (predicting long-term trend towards greater user accessing of works from databases via networks or satellites rather than acquisition of copies of works fixed on material supports). See generally Reichman, *Electronic Information Tools*, *supra* note 48, at 461–67 ("public interest at odds with the two-party deal").

lic institutions, many of which are already indirectly subsidizing so-called private research and development. Even though subscribers to electronic databases are often organizations such as corporations, libraries, and universities, the compiler's market power could make the task of updating scientific and technological undertakings too costly even for them.³⁷¹

In this regard, the Commission's apparent lack of concern for abusive uses of its database extraction right contrasts with its historic and arguably excessive regulation of know-how licensing agreements whose social costs terminate more or less automatically when third parties reverse engineer the licensed innovation.³⁷² A priori, one might have supposed that the need to preserve a free flow of scientific information merited the very highest regulatory safeguards. Ironically, the TRIPs Agreement, which aims to promote the interests of technology-exporting countries in general,³⁷³ affords governments broad new grounds to challenge abusive licensing practices that undermine domestic economic development.³⁷⁴ To the extent that single states or groups of states insist on overprotecting collections of data as an instrument of national or international economic policy, other adversely affected states may sooner or later invoke these and other safeguards in the TRIPs Agreement to defend public access to information in developed as well as developing countries.

f. *Quasi-Artistic Rights Allied to Copyright Law.* — Many established "neighboring rights" regimes that border on copyright law deal with the inherently symbiotic relations between authors and the intermediaries who gather and ticket the public for public performances of copyrighted works, and the performers who actually communicate these works to the paying public. These include laws that protect performers' renditions, broadcasts, and producers' sound recordings.³⁷⁵ New communications technologies have redefined this role between artists and intermediaries by making the old concert hall portable and bringing it into the homes of

371. For this and other reasons, the European Parliament requested an amendment defining "noncommercial purposes" to include the nonprofit activities of teaching, research and humanitarian aid. However, the Commission side-stepped the larger issue by claiming that "profit" was only one of several criteria to consider. See Second Explanatory Memorandum Concerning EC Database Directive, *supra* note 354, at 3; see also OTA Report 1992, *supra* note 365 (concerning fears of Office of Technology Assessment).

372. See, e.g., Guillermo Cabanellas & José Massaguer, Know-How Agreements and EEC Competition Law 65-242 (1991); Valentine Korah, Know-How Licensing Agreements and the EEC Competition Rules: Regulation 556/89 (1989); Jochen Pagenberg & Bernhard Geissler, License Agreements: Patents, Utility Models, Know-How, Computer Software (2d ed. 1989).

373. See, e.g., Reichman, GATT Connection, *supra* note 8, at 754-61.

374. See, e.g., GATT/TRIPs, *supra* note 7, arts. 7-8, 31, 40. See generally Reichman, Beyond the Historical Lines, *supra* note 18, at 100-05, 107-09.

375. See World Intellectual Property Organization, Basic Notions of Neighboring Rights—International Conventions in the Field of Neighboring Rights, at 2, WIPO Doc. WIPO/CR/GE/92/3 (Aug. 20, 1992); see also Stephen M. Stewart & Hamish Sandison, Neighboring Rights, *in* International Copyright and Neighboring Rights, *supra* note 64, at 185-220.

individual viewers and listeners, along with the performers' renditions. In so doing, performers, phonogram producers, and broadcast organizations often add an important artistic dimension to the authors' own contributions. In effect, the neighboring rights laws enable impresarios, producers, and performers to collect a reward for their services even under these changed conditions, and this in turn further ensures that authors covered by copyright law will also receive compensation.³⁷⁶

Largely for historical reasons, international recognition of these rights was secured experimentally with the signing of the International Convention for the Protection of Performers, Producers of Phonograms and Broadcasting Organizations (the "Rome Convention") in 1961.³⁷⁷ Since then, other more specialized conventions have sought either to fill gaps in the Rome Convention or to link both signatories and nonsignatories in efforts directed at the enforcement of a specific neighboring right.³⁷⁸ In a bold departure from the past, Article 14 of the GATT/TRIPs Agreement mandates some recognition of the neighboring rights covered by the Rome Convention, and it sets out international minimum standards that sometimes exceed those established in the Rome Convention.³⁷⁹ Efforts are also underway to integrate some or all of these rights into the domestic copyright laws and, ultimately perhaps, the Berne Convention itself.³⁸⁰

376. See, e.g., Stewart & Sandison, *supra* note 375, at 191–202, 208–220; Herman Cohen Jehoram, *The Nature of Neighboring Rights of Performing Artists, Phonogram Producers and Broadcasting Organizations*, 15 *Colum.-VLA J.L. & Arts* 75, 76–84 (1990).

377. See Rome Convention, *supra* note 64; S. M. Stewart, *The Rome Convention (1961)*, in *International Copyright and Neighboring Rights*, *supra* note 64, at 221–54.

378. See, e.g., Phonograms Convention, *supra* note 64 (requiring member states to prevent unauthorized reproduction of sound recordings); Convention Relating to the Distribution of Program-Carrying Signals Transmitted by Satellite, May 21, 1974, 13 *I.L.M.* 1444 (seeking to strengthen by various means, the prevention of unauthorized dissemination of satellite-relayed programs). See generally S.M. Stewart & Hamish Sandison, *The Phonogram Convention (1971)*; S.M. Stewart & Hamish Sandison, *The Satellite Convention (1974)*, in *International Copyright and Neighboring Rights*, *supra* note 64, at 256–83.

379. See GATT/TRIPs, *supra* note 7, art. 14. As a result, performers of sound recordings would enjoy at least the legal possibility of preventing unauthorized fixation, reproduction, and broadcasting of their unfixed performances, but not necessarily an exclusive right to these performances; producers of sound recordings would enjoy exclusive reproduction rights, but not necessarily public performance rights in their sound recordings; and broadcasting organizations would enjoy exclusive rights of fixation, reproduction, and rebroadcasting of their programs to the public. However, Article 14(6) softens the impact of the neighboring rights provisions by incorporating "conditions, limitations, exceptions and reservations" already permitted by the Rome Convention. See, e.g., David Vaver, *Tripping Through Trips: Canada and Copyright*, 22 *The Canadian Law Newsletter*, Summer 1994, 53, 55–56; see also Patrick Masouyé, *The Rome Convention: Realities and Prospects*, 21 *Copyright* 290, 300–08 (1985).

380. See, e.g., György Boytha, *The Intellectual Property Status of Sound Recordings*, 24 *Int'l Rev. Indus. Prop. & Copyright L.* 295, 304–06 (1993); William R. Cornish, *Sound*

Despite an occasional dependence on new technologies, these neighboring rights laws neither stimulate technological innovation nor systematically violate cardinal economic premises underlying the patent and copyright paradigms.³⁸¹ On the contrary, they establish the outer limits of artistic property law without blurring or undermining the classical line of demarcation separating artistic from industrial property laws. Therefore, these neighboring rights laws do not represent deviant regimes of particular importance to this study, except insofar as apologists for truly deviant regimes tend to invoke them by false or misleading analogies. For example, comparisons between sound recordings and computer programs influenced the CONTU Commissioners' Final Report recommending copyright protection of computer programs. This indicates the lack of technical expertise with which that body reached its conclusions.³⁸²

C. Collapse of the Bipolar Structure Underlying the Great Conventions

Before examining the underlying causes of the proliferating legal hybrids, I note some preliminary conclusions from the data surveyed.³⁸³

First, the nineteenth-century vision that subdivided world intellectual property law into discrete and mutually exclusive compartments for industrial and artistic property has irretrievably broken down. The theory that the classical patent and copyright models coherently address the way intellectual creations behave has been discredited by its inability to deal adequately with the behavior of many commercially valuable, cutting-edge intellectual creations.³⁸⁴ These recent technological creations account for an ever-growing share of the gross domestic products in both developed and developing countries.³⁸⁵

The classical line of demarcation has become increasingly blurred by marginal legal solutions whose objects of protection appear not to resemble either patentable inventions or copyrightable works of art and literature. For example, proprietors protected under the European Community's Directive on Computer Programs obtain an exclusive right to use that software even though the right to use is characteristic of industrial

Recordings and Copyright, 24 Int'l Rev. Indus. Prop. & Copyright. L. 306 (1993). But see Cohen Jehoram, *supra* note 376, at 85-91 (criticizing these efforts).

381. See *supra* text accompanying notes 75-86.

382. See CONTU Final Report, *supra* note 39, at 20-23.

383. For a fuller discussion, see Reichman, *Information Law*, *supra* note 62, at 349-55.

384. See Hermann Kronz, *Patent Protection for Innovations: A Model* (Pt. 1), 5 Eur. Intell. Prop. Rev. 178, 180 (1983) (stressing irrelevance of patent system to real problem of transforming "technical knowledge into products and investment under much more difficult market entry conditions").

385. See Reichman, *GATT Connection*, *supra* note 8, at 754-66; Reichman, *TRIPS Component*, *supra* note 7, at 263-66.

property law and "alien to generally accepted copyright principles."³⁸⁶ Similarly, computer programs sometimes receive a relatively thick form of copyright protection, akin to patent law, rather than the historically thin copyright protection given to functional and factual works.³⁸⁷ Some countries have incorporated patent concepts, including the principle of nonobviousness, into their copyright laws to limit protection of functional tools, including computer programs, masquerading as literary works.³⁸⁸ As the historical line of demarcation gives way and the separate spectrums of industrial and artistic property laws overlap in practice, issues of ownership and scope of protection in any particular case may vary with accidental or trivial aspects of the innovation in question.

Second, the objects protected by the legal hybrids actually resemble each other more closely than they resemble the traditional objects of patent and artistic property laws. Few of the hybrids protect art in the historic sense, and none demand the strict substantive evaluation of the patent regime. Additionally, all the hybrids allow the market directly or indirectly to influence the application of eligibility criteria and scope of protection. Most objects of protection also have a dualist nature that allows them to compete either as disembodied representations of unprotectible matter or as components of material supports distributed on the products market.³⁸⁹

These similarities among the objects of hybrid legal regimes also require a revision of the earlier hypothesis that situated deviant cases at the "thinner" edges of their respective jurisdictional spheres.³⁹⁰ The survey shows, instead, that the patent and copyright paradigms actually overlap. Instead of a clear line of demarcation, there is a permeable line of demarcation that allows an intermediate zone of marginal subject matters to co-exist within a space that the classical system formally ignores. The inability of the historical line of demarcation to impede these developments suggests that the line itself becomes increasingly meaningless under current conditions and that the legal hybrids as a group constitute a potentially autonomous entity.

This hybrid zone deserves independent legal analysis, since it does not rest upon the assumptions underlying the classical bipolar intellec-

386. P. Bernt Hugenholtz, *Convergence and Divergence in Intellectual Property Law: The Case of the Software Directive*, in *Information Law Towards the 21st Century*, supra note 33, at 323; see also EC Software Directive, supra note 261, arts. 4(a), 5(1).

387. See, e.g., *Whelan Assocs., Inc. v. Jaslow Dental Lab.*, 797 F.2d 1222 (3d Cir. 1986), cert. denied, 479 U.S. 1031 (1987).

388. See, e.g., Hugenholtz, supra note 386, at 319. A principled distinction between idea and expression, always difficult to manage in copyright law, has also been undermined by the drive to protect computer programs. See, e.g., id. at 320-22 (noting that "[i]n the old days, cumulative protection by copyright and patent law would have been unthinkable").

389. See supra notes 247-249 and accompanying text.

390. See supra text accompanying notes 89-92.

tual property structure. The marginal cases require treatment as an autonomous entity with a distinct legal and economic logic if they are not to distort further the operations of the dominant paradigms. Moreover, a rethinking of protection for the marginal cases is necessary to counter the cumulative anticompetitive effects of these ad hoc legislative initiatives. These anticompetitive effects result because the marginal cases violate the negative economic premises of the dominant paradigms, yet no uniform, conceptually persuasive economic framework is in place as a substitute.

The legal hybrid solutions override the negative economic premises of the traditional paradigms in several ways.³⁹¹ In contrast to the patent regime, the hybrid legal institutions have lower thresholds for eligibility. All the hybrids typically fail the nonobviousness test and thereby fail to deliver the kind of path-breaking technical achievements that reconciled economic thought with legal monopoly in the first instance. For example, plant varieties, integrated circuit designs, engineering projects, and certain commercial designs need only show some form of "novelty" to qualify under their respective hybrid regimes.³⁹² The standards of "novelty and originality" typically used in design protection laws vary in practice from a nonobviousness-like standard (under the United Kingdom's Registered Design Act of 1949 before the 1988 amendment³⁹³) to mere noncommonplace results of independent creation (under the United Kingdom's unregistered design right of 1988³⁹⁴).

Additionally, in contrast to the tenets of the copyright model, the hybrid legal institutions violate the negative economic premise that limits copyright protection to cultural goods.³⁹⁵ For example, the source code of a computer program or a drawing of an industrial object may resemble literary or artistic production when portrayed as two-dimensional representations of functional or factual matter; it may then receive copyright protection under the principle prohibiting discrimination on the basis of merit. Yet if embodied in three-dimensional products, the hybrid regime

391. See Reichman, *Information Law*, *supra* note 62, at 349–51.

392. See *supra* notes 129, 168–170, 226, 235 and accompanying text. However, the UPOV Agreement, as amended in 1991, see *supra* notes 179–183 and accompanying text, extends the range of equivalents afforded eligible plant varieties without elevating the standard of eligibility. This would potentially make the UPOV model one of the most extreme deviants.

393. See Registered Designs Act, 12, 13 & 14 Geo. 6, ch. 88, § 1 (Eng. 1949), amended by Copyright Designs and Patents Act, ch. 48, §§ 265–73 (Eng. 1988). The 1988 amendment, however, requires only "novelty" and no longer "originality." This change may lower the degree of creativity the courts will require.

394. The exact standard of eligibility required for the United Kingdom's unregistered design right remains uncertain pending judicial determination, but some leading commentators expect the courts to require only independent creation. See, e.g., Fellner, *supra* note 148, at 377–78.

395. See *supra* text accompanying notes 85 and 87.

would extend protection to markets in which industrial, not cultural, exploitation occurs.

The hybrid regimes introduce a cumulative protectionist bias into domestic economies driven by constant innovation, as each regime seeks to overcome the free-rider problem that threatens to inhibit investment in its particular type of innovation.³⁹⁶ This cumulative effect contradicts even the liberalizing thrust of multilateral trade negotiations seeking greater competition in an integrated world market. The risk is that liberalization ultimately will largely affect traditional products of the Industrial Revolution, while producers of nontraditional, high-tech products and processes increasingly take ad hoc protectionist barriers for granted on both the domestic and international markets.³⁹⁷

These transnational legislative trends have virtually eclipsed the nineteenth- and early twentieth-century skeptical view of intellectual property rights, which required compelling economic and social justifications for derogations from free competition. The paradigmatic intellectual property regimes accordingly evolved with strict limitations and exceptions to balance the public interest in competition against specific incentives to create. In contrast, the hybrid legal regimes appear to have been crafted without comparable inhibitions.³⁹⁸ As improvised responses to sectoral protectionist demands, they lack coherent theoretical foundations and reflect different economic premises.

The European Union's proposed Directive on the Legal Protection of Designs as initially put forward illustrates this uncritical and reactive tendency. In principle, free-market economies endow competitors with an absolute right to reverse engineer every unpatented, noncopyrightable product sold on the open market. This is what several United States Supreme Court decisions teach.³⁹⁹ Yet every product sold on the general products market carries a functional design, and the European Union's proposed Directive (derived from the United Kingdom's unregistered design right) should, in effect, provide relatively strong and lengthy protection for many if not all functional designs. In reply to concern that the manufacture of functional products "may be monopolized by the existence of design rights . . . [that omit] a clear distinction between aesthetic and functional design," the drafters of the Union's Explanatory Memorandum disingenuously declared that "experience shows that this distinc-

396. See *supra* notes 31–32 and accompanying text.

397. See generally Reichman, *Beyond the Historical Lines*, *supra* note 18, at 94–98.

398. For expressions of remorse and renewed dedication to free-market principles, see *Kastenmeier & Remington*, *supra* note 59, at 438–42. However, Chairman Kastenmeier was not re-elected, and these tenets have seldom influenced subsequent legislative deliberations.

399. See, e.g., *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141 (1989); *Compco Corp. v. Day Brite Lighting, Inc.*, 376 U.S. 234 (1964); *Sears, Roebuck & Co. v. Stiffel Co.*, 378 U.S. 225 (1964).

tion is largely arbitrary and that protection for functional designs needs in any case to be provided for by some means."⁴⁰⁰

Regardless of whether this particular initiative succeeds or fails, hybrid regimes granting exclusive rights are clearly overpowering nineteenth-century principles of competition. Moreover, the paradigmatic foundations of the international intellectual property system are further destabilized by the tendency of patent, copyright, and trademark laws to mutate under the pressure of events. The protectionist tendency regarding nontraditional innovation and the destabilizing pressure on traditional intellectual property laws lack any unifying principles or standards to guide courts and administrators, and history shows that cycles of chronic under- and overprotection will likely result.⁴⁰¹

Thus this study concerns not only the evolution of intellectual property rights, but also, more fundamentally, the changing nature of competition in the so-called Information Age. In effect, the hybrid legal regimes under review turn the nineteenth-century outlook upside down by presupposing a universe of commercial intercourse in which legal protection becomes a necessary and constant component of economic life.

II. BEYOND ART AND INVENTIONS: A DEFAULT LIABILITY REGIME FOR APPLIED KNOW-HOW

A review of the historical context of the surveyed hybrid legal regimes shows that they all respond to the same empirical phenomenon: a chronic shortage of natural lead time that threatens to prevent producers of unpatented innovation from recouping their investments. If one asks why investors in other industrial activities should not similarly avoid the rigors of unrestrained competition, the standard economic response is that investors in most forms of industrial activity already obtain sufficient

400. See EC Explanatory Memorandum on Designs, *supra* note 118, at 18. However, the current version of the proposed directive on designs pulls back from outright protection of functional designs, in keeping with a pending decision to formulate a European Union Directive on Utility Models. This, too, would further magnify the cumulative restraints on trade.

401. For examples in the design and computer program contexts, see *supra* text accompanying notes 143–144, 286–292, and 300. In general, overprotection results from the progressive monopolization of ever smaller aggregates of inventive activity, which elevate social costs in return for no clearly equilibrated social benefits. Yet, the nonobviousness standard and its variants can also induce states of chronic underprotection by excluding the bulk of the incremental innovations that underlie today's most promising technologies. The recurring oscillations of industrial designs between over- and underprotection during a two-hundred-year period of regulatory activity under design protection laws, see *supra* text accompanying notes 119–144, were thus precursors of the developments that world intellectual property law would strive to accommodate in the last half of the twentieth century.

lead time. Oddly enough, considerable evidence supports this contention, at least with respect to the more traditional forms of innovation.⁴⁰²

The survey also shows that whenever legislators became convinced that a real or perceived shortage of lead time affecting particular industries merits government intervention, the automatic response (with some notable exceptions⁴⁰³) was to provide artificial lead time through grants of exclusive property rights built on modified patent or copyright principles. In other words, the nexus between a lack of natural lead time and the enactment of exclusive property rights has, until recently, been largely unquestioned from the technical legal standpoint.⁴⁰⁴ Most economists challenge every grant of intellectual property rights as an unwarranted and potentially harmful derogation from the competitive ethos, and even the patent and copyright models have won only grudging acceptance in this regard. But precisely because hostile economists almost uniformly prefer to let the market solve its own problems, they seldom question whether the standard legislative response might prove technically deficient for other reasons.

In reality, no compelling logical nexus exists between a chronic shortage of natural lead time and the grant of exclusive property rights. The standard legislative response will not withstand legal and economic analysis. This Part demonstrates that legislators can obtain all the advantages and few of the disadvantages of exclusive property rights, at far more acceptable social cost, by instituting a modified liability regime that deals directly with applications of scientific and technical know-how to industry.

402. See, e.g., Levin et al., *supra* note 25, at 816; see also Josh Lerner, *The Importance of Trade Secrecy: Evidence from Civil Litigation*, paper presented to the Conference on the Economics of Intellectual Property Rights, ICARE Institute, University of Venice, Italy (October 6–8, 1994). What makes this odd is the availability of empirical data bearing on the question, a phenomenon that rarely occurs with regard to basic issues of intellectual property law. However, the data in these studies refer almost invariably to traditional forms of innovation; hence they fail to detect the problems discussed below. See *infra* text accompanying notes 441–460.

403. See *supra* note 226 and accompanying text for the example of engineering projects in Italian intellectual property law. Since 1985, moreover, the Swiss and Japanese reforms of unfair competition law also have deviated from the standard practices. See *supra* notes 209–218 and accompanying text.

404. Apart from the evolution of foreign unfair competition laws and the accompanying literature, the most notable exceptions to the norm in American literature were contributions by Professors Dreyfuss and Gordon. See Dreyfuss, *supra* note 10, at 908–12; Gordon, *supra* note 43, at 277–78. Both authors recognize the unique nature of information products and demonstrate the need for a liability approach. See also K. Grant Hammond, *Quantum Physics, Econometric Models and Property Rights to Information*, 27 McGill L.J. 47, 54–60 (1981); Antoon A. Quaedvlieg, *Economic Analysis of Law*, in *Information Law Towards the 21st Century*, *supra* note 33, at 379, 393 & n.78 (citing papers by Teiji and Holzhauser, who reportedly express interest in the use of liability rules).

A. *Contraction of Lead Time in Design Dependent Technologies*

As noted earlier, investors in ordinary, unpatented innovation obtain lead time because competitors must overcome learning curve advantages and the effects of both actual and legal secrecy when imitating new products and undisclosed processes.⁴⁰⁵ Learning curve advantages may have decreased with respect to the simpler, everyday products of early industrialization, which firms everywhere can now easily copy, but may have increased with respect to the more complex products of today's advanced technological sectors.⁴⁰⁶ In any event, as long as innovators manage to conceal their unpatentable know-how behind factory walls, third parties intent on imitating the products of that know-how have only three choices: (1) to create the products independently from scratch; (2) to reverse engineer them from existing exemplars; or (3) to license the relevant product or process from its originators. In practice, however, trade secret laws (or equivalent laws of confidentiality) circumscribe this menu of business strategies by requiring competitors to accomplish the task of reverse engineering by proper means and not by commercial bribery, breach of confidence, or industrial espionage.

1. *Competition Presupposes Lead Time.* — If a competitor intent on imitating an unpatented product or process chooses not to license the originator's undisclosed technical innovation, he or she must have calculated that it will cost less to discover it independently or to reverse engineer it. How much less depends initially on the state of the competitor's own research and development. If, for example, the competitor had already approached the same achievement by independent means, it may take relatively little more effort to succeed. In that case, the competitor's total investment in research and development would equal the sum of time and money already spent plus any additional time and money to reach the desired result. If, instead, the competitor were a new entrant attracted to the market by the success of the originator's own product or process, the costs of entering would probably equal the costs of reverse engineering, plus any ancillary costs of establishing points of distribution and advertising.

Between these two extremes, the would-be imitator's costs in time and money always depend on the state of his or her own prior research and development combined with the difficulties of reverse engineering and those of overcoming learning curve disadvantages. Provided these factors produce a result palpably greater than zero, the second comer's

405. See Levin et al., *supra* note 25, at 815–16; *supra* notes 21, 24–40 and accompanying text. Of course, investors in extraordinary, patentable innovation obtain artificial lead time through the operation of exclusive property rights that block imitation of the same product or process by essentially the same means for a fixed period of time. See, e.g., 35 U.S.C. §§ 154, 271 (1988 & Supp. 1994).

406. See, e.g., Paepke, *supra* note 223, at 61 (“The pace of innovation and imitation in emerging high technology industries is observably faster.”).

ability to compete by imitation depends on his willingness and capacity to absorb these costs in time and money while still profiting. By the same token, it is precisely the competitor's willingness and capacity to incur these costs in time and money that provide originators with natural lead time.⁴⁰⁷

To the extent that dynamic market economies require sustained investment in unpatented innovation and not only patentable discoveries, they depend heavily on trade secret laws to provide risk-averse investors with a sufficient quantum of natural lead time.⁴⁰⁸ Because these laws operate on quasi-liability principles, their delivery of natural lead time occurs without the social costs inherent in rigid grants of exclusive property rights. By the same token, these ancillary liability rules impose social costs of their own, which must be weighed against those of the exclusive intellectual property rights they complement.⁴⁰⁹ They also tend to fail in their essential purpose whenever the would-be imitator's costs of reverse engineering an originator's innovative product or process approach zero, a phenomenon that often occurs without respect to the technical complexity or relative social value of the innovation in question. Of the two evils, economists tend to overestimate the first and to underestimate the second.

The well-known social costs of trade secret protection stem principally from the innovator's expenses in preserving secrecy and from the obligation not to disclose technically valuable information to the public. Other frequently mentioned negative factors include unduly broad or restrictive constraints on the ability of employees or licensees to put information to its highest value, overly broad injunctive remedies that restrict use after information becomes available to the public, and a generalized disincentive for second comers rapidly to exploit unpatented innovation owing to the uncertain risk of litigation. There are also concerns that the diversion of investment resources to reverse engineering leads to wasteful duplication of effort, which is compounded when technical communities forego publication of research results for commercial purposes.⁴¹⁰

While scholars often worry that these costs outweigh the benefits received, their concerns usually stem from a comparison of trade secrets and patents, often on the tacit assumption that investors may choose either mode of protection. In reality, the bulk of all innovation issuing from total aggregate investment in research and development fails to satisfy the strict eligibility requirements of either the patent or copyright

407. See, e.g., *id.* (only during the "window" between the introduction of an innovation and the onset of competition from appropriators" can "the investor anticipate earning some return on the incremental investment in innovation").

408. See e.g., Nelson & Winter, *supra* note 11, at 275; Paepke, *supra* note 223, at 57, 60-62 (preferring misappropriation law to trade secret law for these purposes).

409. See, e.g., Paepke, *supra* note 223, at 66.

410. See, e.g., Cheung, *supra* note 36, at 44-45; Stedman, *supra* note 13, at 28-32; see also Eisenberg, *supra* note 37, at 194 (stressing need of scientists to hoard information).

laws by definition.⁴¹¹ An ever-growing component of this unpatentable, noncopyrightable innovation consists of advanced technological know-how that requires large and sustained investment in research and development to produce.⁴¹² A more accurate assessment of the trade secret model therefore requires investigators to compare the social costs and benefits of protecting investment in unpatented, noncopyrightable innovation eligible for trade secret protection with those likely to result when the producers of similar innovation must fend for themselves in the open market.⁴¹³

411. Compare 35 U.S.C. §§ 102, 103 (1988 & Supp. 1994) (excluding patent protection for all routine inventions not rising to the level of objective novelty and nonobviousness, as defined in *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966)) with 17 U.S.C. § 102 (Supp. 1994) (allowing copyright protection only for original and minimally creative works of authorship and excluding ideas and functionally determined matter). In reality, of course, overwhelming pressures are brought to lower the nonobviousness standard and to expand the "original works of authorship" requirements in order to accommodate technological refugees that have nowhere else to go for protective relief. See, e.g., Reichman, *Programs as Know-How*, *supra* note 274, at 662-63.

412. See, e.g., Magnin, *supra* note 22, at 114 ("know-how plays a considerable role in modern industry, whose activities are essentially based upon innovation"); Stanislaw J. Soltysinski, *Are Trade Secrets Property?*, 17 *Int'l Rev. Indus. Prop. & Copyright L.* 331, 331 (1986) ("Trade secrets, know-how and other intangibles covering technical and commercial knowledge . . . represent enormous economic values, and are the fastest growing major commodity in many countries," including the U.S., despite the uncertain status of trade secret protection even in developed legal systems.).

413. Cf. Institute of Law Research and Reform [Edmonton, Alberta] & A Federal Provincial Working Party, *Trade Secrets* 124-25 (Rep. No. 46, July 1986) (free-rider problem afflicting appropriability of results from generating valuable information encapsulates moral and economic arguments justifying trade secret protection); see also Nelson & Winter, *supra* note 11, at 267 (deploring dearth of empirical studies of relationship between innovation and investment).

Most intangible technical creations manifest only cumulative, incremental improvements over the prior art. See, e.g., Kingston, *supra* note 49, at 1-3, 31-33. Hence, they either qualify for trade secret protection (by dint of their undisclosed character and of legally sufficient efforts to preserve it) or they incur the rigors of free competition under the Supreme Court's long-standing interpretation of the constitutional enabling clause. See, e.g., *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 159-64 (1989) (federal patent and copyright laws preempt state statute forbidding duplication of unpatented, noncopyrightable industrial designs by "plug mold" method); *Sears, Roebuck & Co. v. Stiffel Co.*, 376 U.S. 225, 228-31 (1964), (refusing to allow unpatented design to obtain protection against misappropriation under state unfair competition law). But see *Goldstein v. California*, 412 U.S. 546, 552-61 (1973) (recognizing limited power of states to apply copyright protection to subject matter of local interest that Congress has left unattended); *International News Serv. v. Associated Press*, 248 U.S. 215, 234 (1918) (recognizing quasi-property right in noncopyrightable news reports).

So long as intangible creations subject to unrestricted competition enjoy natural lead time due to such factors as actual secrecy, learning curve advantages, pricing strategies, and objective difficulties of reverse engineering, one may presume—subject to empirical refutation—that greater social welfare results from free competition than from laws protecting undisclosed information. See, e.g., Dreyfuss, *supra* note 24, at 689; Levin et al., *supra* note 25, at 784, 794-97, 799. But see Paepke, *supra* note 223, at 61-62 (who sees weakness of these incentives as unduly favoring investment in patentable rather than

Economists wary of the deleterious effects of risk aversion posit that, at the limit, potential innovators would make no investment in technological innovation at all if they could not appropriate any returns from their efforts.⁴¹⁴ This is the type of market failure that would threaten optimal investment in unpatented technologies if second comers remained totally free to bribe or steal their way into possession of the innovator's otherwise undisclosed information⁴¹⁵ without regard to the search and prospecting costs of producing it.⁴¹⁶ By impeding industrial espionage, commercial bribery, breaches of trust, and other market-distorting conduct, trade secret laws (or equivalent laws of confidential information)⁴¹⁷ render undisclosed innovation factually or legally appropriable⁴¹⁸—without the grant of any exclusive property rights⁴¹⁹—for as long as it takes competitors either to reverse engineer by proper means or to purchase the resulting lead time under licensing agreements.

The social benefits conferred by trade secret law with respect to unpatented, noncopyrightable innovation thus derive primarily from the incentive to invest that limited appropriability supports, while the social costs of such protection are reduced by resorting to a set of liability rules that avoid the barriers to entry and other disutilities inherent in exclusive

unpatented innovation). In practice, however, the more that a particular unpatented, noncopyrightable innovation seems likely to yield substantial profits from the market, the greater the inducement there would be to second comers to reduce the originator's lead time to zero, if possible, by bribing employees and engaging in other forms of industrial espionage that trade secret laws forbid. Cf., e.g., Stedman, *supra* note 13, at 24–25 (noting that value of head start varies with difficulties attending independent discovery and with “the importance and value of the data to others . . . [and] the consequent effect upon their efforts to ferret out the secrets”); Paepke, *supra* note 223, at 61 (without some remedy to the contrary, “a prospective investor in an unpatentable innovation only has the hope that his competitors will not appropriate his innovation too quickly”).

414. See, e.g., Besen & Raskind, *supra* note 16, at 5; Cheung, *supra* note 36, at 41 (stating that “there can be no pecuniary or nonpecuniary private return without some form of protection and that, lacking protection and an expected return, scarcely any private development of ideas will take place”); Paepke, *supra* note 223, at 61; see also Kim Lane Schepple, *Legal Secrets* 29 (1989).

415. See Paepke, *supra* note 223, at 61; *supra* note 413.

416. See Friedman et al., *supra* note 14, at 65 (importance of both reward and prospect theories in trade secret law as well as patents); cf. Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & Econ. 265, 267–75 (1977) (prospecting function of patent system).

417. See *supra* notes 13–15 and accompanying text.

418. “Theft and reverse engineering are substitute methods of appropriating a trade secret.” Friedman et al., *supra* note 14, at 70.

419. See, e.g., *id.* at 62–63 (trade secret not property in usual sense because possessor has no exclusive right to possess or enjoy); *id.* at 66, 70–71 (benefits of stimulating reverse engineering without forbidding the copying of productive ideas). In contrast, other investigators leap to the assumption that, because there is a genuine need to cure a “public goods” problem by the provision of incentives, some form of exclusive property right is in order. See, e.g., Cooter & Ulen, *supra* note 43, at 135, 135–44; Schepple, *supra* note 414, at 31, 41.

property rights.⁴²⁰ Using exclusive property rights to overcome the "public good" character of intangible creations carries the inherent risk that too much production of the desired creations will result and too little of it will be used.⁴²¹ In contrast, trade secret law provides no monopoly whatsoever and no arbitrarily imposed fixed term of protection that limits the second comer's ability to exploit the originator's product or process. Rather, the term of protection against imitation by improper means varies with the ability of second comers to reverse engineer by proper means.⁴²² The latter's decisions to invest or not to invest in reverse engineering or in other modes of independent discovery turn, moreover, on individual business strategies, including an assessment of opportunities to improve upon the originator's own products.⁴²³ In other words, second comers base such decisions on market factors that are not skewed by the drive for winner-take-all rewards.

In sum, competition with respect to the products and processes of unpatentable innovation presupposes a degree of natural lead time, and the modified liability rules⁴²⁴ of classical trade secret law supply that lead time as best they can. The real problem with this ancillary safety net underlying the larger intellectual property framework is its propensity to supply too much or too little lead time at the margins where reverse engineering proves either too hard or too easy. These arbitrary and irrational results flow initially from the fact that secrecy (or the lack of it) does not reliably indicate social value; they are compounded whenever a second comer's costs of reverse engineering unpatented innovation of real social value tends to approach zero for one reason or another.⁴²⁵ This chronic inability of the classical trade secret regime to supply certain industrial sectors with sufficient lead time had already begun to disrupt the international intellectual property system at the end of the nineteenth century.⁴²⁶ A century later, the cutting-edge technologies of the Information Age⁴²⁷ had become so inherently susceptible of instant duplication that

420. See *supra* notes 29–30 and accompanying text.

421. See, e.g., Cooter & Ulen, *supra* note 43, at 135; Gordon, *supra* note 31, at 854–59; Mackaay, *supra* note 33, at 49–52 (stressing experimental nature of compromises between need to stimulate and need to limit monopoly power that exclusivity entails).

422. See, e.g., Cheung, *supra* note 36, at 41, 49.

423. See, e.g., Friedman et al., *supra* note 14, at 67, 69–70; see also Ejan Mackaay, *The Public's Right to Information*, in *Information Law Towards the 21st Century*, *supra* note 33, at 167, 173–74 (stressing importance of denying information to competitors as inducement to competition and contrasting winner-take-all rewards with weaker reward systems "in which all the runners-up also get substantial prizes").

424. See *supra* notes 29–43 and accompanying text.

425. See *supra* notes 36–40 and accompanying text.

426. See *supra* text accompanying notes 99–120.

427. See, e.g., Hammond, *supra* note 404, at 47–49; Stephen Saxby, *The Age of Information—The Past Development and Future Significance of Computing and Communications* (1990).

investors could no longer count on the system as a whole to provide natural lead time.

2. *Incremental Innovation Bearing Know-How on Its Face.* — From this perspective, the failure of international intellectual property law to accommodate early marginal cases⁴²⁸ is actually rooted in a failure of the mediating role that the domestic trade secret laws tacitly played in all developed national systems. While the national and international patent systems have elaborated more or less workable conceptual frameworks for evaluating and protecting product and process inventions⁴²⁹ (except where certain cutting edge technologies, such as computer programs and biotechnology are concerned⁴³⁰), industrial designs were never success-

428. See, e.g., Pérot-Morel, *supra* note 142, at 16, (characterizing industrial art as a "legal hybrid" that different legal subcultures subject to conflicting and sometimes irreconcilable demands).

429. The statutory subject matter set out in 35 U.S.C. § 101 (1988), for example, is traditionally broken down into two broad categories, viz. product and process patents. See, e.g., 1 Rosenberg, *supra* note 96, § 6.01[2]. The category of product patents "embraces physical objects or instrumentalities and . . . comprehends all machines, manufactures, and compositions of matter," while the other category "embraces all physical operations and thus comprehends all processes." *Id.* A process consists of "an act, operation or step, or of a series thereof, performed upon specified subject matter to produce a physical result." *Id.* § 6.01[1]. The doctrines that pertain to claim drafting, eligibility, and even infringement may then vary with the product and process characterization. According to Rosenberg, "the patentability of a process claim must turn upon process limitations; the patentability of machine claims must turn upon machine limitations." *Id.* § 6.01.

At the international level, the Paris Convention dealt primarily with national treatment and priority; it never established international minimum standards concerning patentable subject matter, eligibility, and duration, which was considered one of its principal weaknesses. See Paris Convention, *supra* note 4, arts. 1-5*ter*, 21 U.S.T. at 1585-92; Reichman, GATT Connection, *supra* note 8, at 764-68, 816-18; see also Reichman, TRIPS Component, *supra* note 7, at 181-210 (discussing measures to cure these omissions in GATT/TRIPs, including recognition of patentee's exclusive right to import all relevant products).

430. In both domestic and foreign patent laws, the status of non-naturally occurring organisms and microorganisms, especially live organisms contrived by genetic engineering, as patentable products (i.e., as compositions of matter or as articles of manufacture) remains controversial, despite some broadening of eligible subject matter by the U.S. Supreme Court. See, e.g., *Diamond v. Chakrabarty*, 447 U.S. 303 (1980); *Burk*, *supra* note 50, at 33-34 (stating that "biotechnology inventions by their very nature have blurred the traditional distinctions between products and processes"); Janice McCoy, *Patenting Life in the European Community: The Proposed Directive on the Legal Protection for Biotechnological Inventions*, 4 *Fordham Intell. Prop., Media & Ent. L.J.* 501, 501-03 (1993). By the same token, the status of computer programs as patentable processes, rather than ineligible "mental" or "nonphysical" steps, remains controversial in both domestic and foreign law, despite some broadening of eligible subject matter by the U.S. Supreme Court. See, e.g., *Diamond v. Diehr*, 450 U.S. 175 (1981); *Arrhythmia Research Technology, Inc. v. Corazonix Corp.*, 958 F.2d 1053 (Fed. Cir. 1992); Samuelson, *supra* note 297, at 1028-31; see also Robert P. Merges, *Patent Law and Policy—Cases and Materials* 45-100 (1992); 1 Rosenberg, *supra* note 96, § 6.01[1][a]. These uncertainties are reflected in the GATT/TRIPs Agreement, *supra* note 7, art. 27. See generally Reichman, TRIPS Component, *supra* note 7, 191-203.

fully integrated into this framework nor were they admitted to the international copyright system that complements it.⁴³¹

In giving physical expression to technical, organizational, and marketing demands, modern industrial design seeks to harmonize these demands with the interplay of functional and aesthetic features that yield the desired volume of sales within parameters set by the world market.⁴³² For example, innovative industrial designs typically reflect only small variations on established themes or style trends and often entail a rearrangement or new combination of pre-existing elements or features.⁴³³ These variations seldom meet the strict requirement of nonobviousness in pat-

431. The Berne Convention, *supra* note 4, arts. 2(1), 2(7), 7(4), S. Treaty Doc. No. 99-27, at 1, 3, 10, requires member states to recognize some "works of applied art" in their domestic copyright laws. However, these provisions also allow member states to distinguish copyrightable works of applied art from noncopyrightable "industrial designs" according to their own legislative criteria. The noncopyrightable designs, normally regulated by *sui generis* design protection laws, become subject to Paris Convention, *supra* note 4, arts. 5*quinqüies* (requiring member states to protect industrial designs), 2(1) (national treatment), 4(A)(1) & (c)(1) (right of priority lasting six months). See also Hague Agreement, *supra* note 64. The Hague Agreement has been supplemented by the additional Act of Monaco, Nov. 18, 1961, and the Complementary Act of Stockholm, July 14, 1967. See Pierre Maugué, *The International Protection of Industrial Designs Under the International Conventions*, 19 U. Balt. L. Rev. 393, 397-400 (1989/1990) (noting that Hague Agreement, which facilitates a single international deposit valid in other member countries, in no way overrides the divergent substantive laws of these states, which actually determine eligibility). See *supra* text accompanying notes 119-150. In the United States, most three-dimensional industrial designs are denied copyright protection, see 17 U.S.C. §§ 101-102 (1988) (definitions of "pictorial, graphic, . . . sculptural works," and "useful articles"), while those few industrial designs meeting the nonobviousness requirement may qualify for design patents, a category separate from the product and process patents, mentioned in the text. See 35 U.S.C. § 103, 171-173 (1988). Apart from the United States (and one or two other countries), which still protects industrial designs under the full patent paradigm, and France, which still protect them under the full copyright paradigm, most developed countries during the second half of the twentieth century resorted to *sui generis* design protection laws, built on modified patent principles, that yielded the unsatisfactory empirical results surveyed earlier in this Article. Although the U.S. still remains one of a handful of countries that protects industrial designs under the full patent paradigm, recent multilateral trade negotiations seems destined to change this practice. See Reichman, *TRIPS Component*, *supra* note 7, at 243-46.

432. See, e.g., Lorenz, *supra* note 118, at 10-27, 145-49; S.A. Gregory, *Strategy and Design: A Micro Level View*, in *Design and Innovation: Policy and Management* xi, xii-xiii (Richard Lansdon & Roy Rothwell eds., 1985). Design protection law has not elaborated any conventional definition of design, and the few definitions recognized for legal purposes reflect the historical distinction between "art" and "industry" that underlies the Great Conventions. See 2 Ladas, *supra* note 15, at 829 ("an ensemble of lines, surfaces, volumes, and profiles connected with each other in subtle or unique ways so as to give a characteristic external appearance to an article. . ."); see also 1 Rosenberg, *supra* note 96, § 6.01[3] (separating design patents (like plant patents) from product and process patents).

433. See, e.g., Wim Crouwel, *A Designer's View of Plagiarism*, in *Design Protection* 155, 161-62, 167 (Herman Cohen Jehoram ed., 1976) (stating that, to the designer, "[e]xamples exist to be further developed and copied"); Gregory, *supra* note 432, at 11 (stating that "where solutions in principle already exist, new variants may be developed by

ent law; their functionally determined characteristics usually preclude copyright protection, despite the more flexible eligibility requirements of this law;⁴³⁴ and the public availability of the designers' innovative know-how in one form or another undermines the cardinal premise for actual or legal secrecy.⁴³⁵ Would-be investors in innovative designs that are costly and risky to produce consequently suffer from a chronic lack of natural lead time in which to recoup their investments and turn a profit.⁴³⁶

Because industrial designs in this vulnerable condition seldom partook of "art" or "inventions" according to the criteria that classical intellectual property law established, they fell through the cracks in the Paris and Berne Conventions from their very inception⁴³⁷ without landing in the safety nets that the domestic trade secret laws normally extend between intellectual property rights and free competition. Efforts to fill these gaps by strained applications of the patent and copyright paradigms or by devising *sui generis* design protection laws built around exclusive property rights have led to the recurring cycles of under- and overprotection described above, which tend to confirm the validity of the "public

morphological analysis accompanied by low-cost product heuristics"); see also Jay Dratler, Jr., *Trademark Protection for Industrial Designs*, 1988 U. Ill. L. Rev. 887, 892 (1988).

434. See *supra* notes 120–123 and accompanying text; *Baker v. Selden*, 101 U.S. 99, 100–01 (1879); Reichman, *Programs as Know-How*, *supra* note 274, at 690–96, 693 n.288; see generally 2 Goldstein, *supra* note 72, § 8.5–8.5.2.2. Any third party who lawfully obtains the product can rapidly duplicate the embodied design without incurring the time and expense of reverse engineering and can then offer products bearing the copied design at a price below the innovator's average costs of production.

435. See Russell Harkin, *A Design Right for Computer Programs?*, 9 *Computer L. & Prac.* 94, 94–95 (1993) (stating that words are merely a tool for expressing the functional design of program, noting "relative salary scales in the computer industry indicate that the value of a system is achieved when it is designed, not coded," and concluding that authorship occurs mainly "at the point of system design."). See generally Manifesto, *supra* note 61, at 2335–36. Computer programs present a typical example "because most programs do not contain nonobvious concepts of the type which are susceptible to patent protection" even though their creation involves "a substantial amount of investment. The patent system can adequately protect inventive concepts . . . [but] does not have any means of protecting the investment which goes into developing noninventive innovations." Galbi, *supra* note 55, at 281.

Although observers describe a similar situation in biotechnology in which a few pioneer patents may render the bulk of later applications obvious in the legal sense, the extent of this problem remains controversial. See, e.g., Korn, *supra* note 38, at 216–17, 231 (noting problems of novelty, utility, and disclosure requirements in regard to biotechnology). But see Keith Hodkinson, *Protecting and Exploiting New Technology and Designs* 72–100, 135–36 (1987) (suggesting that nonobviousness requirement may be less of a problem for biotechnology industries).

436. See, e.g., Perret, *supra* note 106, at 13–19; Reichman, *Designs Before 1976*, *supra* note 127, at 1164 (citing other authorities). Design protection laws aim to keep this gap from widening to the point where healthy firms cannot obtain a profit, and they also enable innovators to establish product-related secondary meaning for purposes of trademark law.

437. See, e.g., 2 Ladas, *supra* note 5, at 827–28, 833–86.

good" approach to intellectual property law in general.⁴³⁸ If few other fields of industrial activity succumbed to the same sort of market failure at the end of the nineteenth century,⁴³⁹ it was largely because trade secret laws provided (and continue to provide) natural lead time to investors in most innovative products and processes not otherwise eligible for patent or copyright protection.⁴⁴⁰ What altered this fragile equilibrium by the middle of the twentieth century was the rise of new technological paradigms⁴⁴¹ that depended for much of their commercial value on design-like innovation that differed markedly from the product and process innovations typical of the Industrial Revolution.

Two obvious examples are the emergence of the semiconductor chip industry⁴⁴² and large-scale commercial development of novel plant varieties,⁴⁴³ both of which typically depend on incremental design solutions that become embodied in the end products themselves.⁴⁴⁴ As previously observed, the United States Congress broke with long-standing constitutional tradition when confronted with the vulnerability of these designs to free-riding imitation and embarked upon this country's first experiments with *sui generis* intellectual property regimes.⁴⁴⁵ Less obvious is the extent to which cumulative improvements in both computer programs and biogenetic engineering likewise depend on the design of information structures that transcend material constraints as well as the traditional

438. See *supra* notes 1, 144 and accompanying text.

439. However, handtool designs, which surfaced in German, Japanese, and Italian utility model laws, see *supra* text accompanying notes 99–117, and engineering projects, which surfaced as such in Italian law, see *supra* text accompanying note 226, were additional precursors of the market failure mentioned in the text.

440. See Gregory, *supra* note 432, at 11–12 (explaining normal interrelationship between product to be manufactured and marketed, manufacturing process, and design considerations that bear on marketing and competitive strategies); *supra* text accompanying notes 19–34; see also Stedman, *supra* note 13, at 28–29. Professor Stedman was the earliest known authority to recognize that the puzzle of design protection emanated from the inability of trade secret law to provide lead time, and that this was a more general problem afflicting other forms of innovation, which *sui generis* foreign laws—including utility model laws—had tried to solve.

441. See Nelson & Winter, *supra* note 11, at 229, 255–72 (discussing theory of technological regimes or paradigms and technological trajectories).

442. See, e.g., Rauch, *supra* note 241; Theodore Shih, *The Semiconductor Chip Protection Act of 1984: Is Copyright Protection for Utilitarian Articles Desirable?*, 7 *Computer/L.J.* 129, 131–37 (1986).

443. See, e.g., Andre Heitz, *History of the UPOV Convention and the Rationale for Plant Breeders' Rights*, in *International Union for the Protection of New Varieties of Plants (UPOV), UPOV Seminar on the Nature of and Rationale for the Protection of Plant Varieties Under the UPOV Convention 19–42*, UPOV Doc. No. 697[E] (1991).

444. See, e.g., Pamela Samuelson, *Creating a New Kind of Intellectual Property: Applying the Lessons of the Chip Law to Computer Programs*, 70 *Minn. L. Rev.* 471, 490–92 (1985); Seay, *supra* note 152, at 64.

445. See, e.g., *supra* notes 164–166, 232–233 and accompanying text.

distinctions between "products" and "processes."⁴⁴⁶ The role of industrial design has thus evolved to the point where it constitutes a third dimension in the application of scientific and technical knowledge to industry, one that continually mediates between the development of manufacturing processes and product manufacture.⁴⁴⁷ This evolution is not just some passing phase, but a step in the permanent transformation of relations between science and industry, in the course of which design processes will continue to blur the established lines of demarcation between theoretical and applied science.⁴⁴⁸

446. For the crucial importance of design solutions in computer programs, see Manifesto, *supra* note 61, at 2333-37; see also Bill Curtis, Engineering Computer "Look and Feel": User Interface Technology and Human Factors Engineering, 30 *Jurimetrics J.* 51, 63-75 (1989); Katherine McCoy, Forward, *in* Design in the Information Environment—How Computing is Changing the Problems, Processes and Theories of Design 1, 1-6 (Patrick Whitney ed., 1985).

For the situation with respect to biotechnology, see, e.g., Straus & Moufang, *supra* note 188:

[C]ommentators have almost without exception ignored the dual structural-informational nature of the results of biotechnological research and development. When a researcher isolates and purifies a new micro-organism strain, or develops a new type of hybridoma cell line, or arrives at a new type of plant material, he is on the one hand creating structure in the form of physical objects, but on the other . . . he is developing new information. . . . [T]he close linking of these two aspects . . . [means] the information is tied to the physical object (the micro-organism, the cell line, the plasmid, the DNA molecule), and it cannot be communicated without this object. Furthermore, because of its biological nature, the physical object acquires a special value, *since it carries the information necessary for the creation of future physical objects (subsequent generations, etc.) in itself and can pass this information on.*

Id. at 95 (emphasis added); accord, Burk, *supra* note 50, at 33-34, 37-39, who states: [M]uch of the value of biotechnology lies in its ability to make available known but rare substances by harnessing the natural machinery of the cell. Thus, . . . [biotechnology presents] a class of inventions whose purpose is in some ways fundamentally at odds with basic definitions of the patent law. . . . [These] inventions *by their very nature have blurred the traditional distinctions between products and processes.* A recombinant cell, for example, is a patentable product, but it . . . carries out a variety of internal processes to produce other patentable products.

Id. at 33-34 (emphasis added).

447. See, e.g., Curtis, *supra* note 446, at 76 (describing joint efforts to design user interface of computer program); McCoy, *supra* note 446, at 2-6 (stressing dematerialization and human factors). This broader notion of design transcends all fields of individual innovation in its "concern with how things ought to be, with devising artifacts to attain goals" through a "cognitively based, problem-solving activity" whose "purpose . . . is to create or restructure a situation-specific component, product or service which effectively achieves engineering goals and meets organizational or social needs." Richard Lansdon & Roy Rothwell, Introduction, *in* Design and Innovation: Policy and Management, *supra* note 432, at xi-xiii.

448. See, e.g., Eisenberg, *supra* note 37, at 195; Allen Newell, Response: The Models are Broken, *The Models Are Broken!*, 47 *U. Pitt. L. Rev.* 1023, 1026, 1033 (1986) (discussing breakdown of distinction in computer science where boundary between data and program becomes fluid); Reichman, Electronic Information Tools, *supra* note 48, at 472-75. Ultimately, the evolutionary tendencies common to most of the new technologies

A common problem thus connects the failure of the dominant paradigms sufficiently to protect the new technologies and the older difficulties that faced industrial designs. Although innovators in the new technologies have carried the design process to extraordinary levels of refinement,⁴⁴⁹ their know-how falls through the cracks in the intellectual property system. Unless the requirements of patentability are lowered to accommodate this type of innovation,⁴⁵⁰ or other legal and self-help devices of doubtful efficacy are employed to restrain third parties from duplicating them,⁴⁵¹ firms engaged in these activities frequently cannot invoke the trade secret laws that otherwise provide investors in unpatented innovation with some interval of natural lead time in which to recoup their investments.⁴⁵²

seem destined to transform design processes in ways that are not captured by the term "industrial design" in its current usage.

449. See, e.g., McCoy, *supra* note 446, at 2-5 (stressing need for "design for non-artifact design solutions"); *supra* notes 446-447.

450. As regards computer programs, see, e.g., Samuelson, *supra* note 297, at 1142-53 (case against patent protection for computer programs); Manifesto, *supra* note 61, at 2343-47 (warning against lowering patent standards of eligibility to accommodate computer programs). But see Chisum, *supra* note 297. As regards biotechnology, see Epstein, *supra* note 193, at 434-452.18; *supra* notes 184-193 and accompanying text.

451. See, e.g., *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1523-24, 1529-30 (9th Cir. 1992) (stating that attempts to monopolize the market by making it impossible for others to compete violates purpose of copyright law and holding that use of trademark to exclude competitors from the market is inconsistent with Lanham Act §§ 32(1)(a), 43(a)); see also 15 U.S.C. §§ 1114(1)(a), 1125(a) (1988 & Supp. V 1993); *Lasercomb America, Inc. v. Reynolds*, 911 F.2d 970, 978-79 (4th Cir. 1990) (invalidating certain restrictions on reverse engineering of computer programs); *Vault Corp. v. Quaid Software Ltd.*, 847 F.2d 255 (5th Cir. 1988) (refusing to enforce "shrink wrap" licenses that unduly constrain the user's rights to make additional copies or the publisher's rights to reverse engineer); Charles R. McManis, *Intellectual Property Protection and Reverse Engineering of Computer Programs in the United States and the European Communities*, 8 High Tech. L.J. 25, 45-87 (1993); David A. Rice, *Public Goods, Private Contract and Public Policy: Federal Preemption of Software License Prohibitions Against Reverse Engineering*, 53 U. Pitt. L. Rev. 543 (1992). Software producers, frustrated by their inability to enforce private restraints on users' and purchasers' rights at the federal level, have now persuaded the revisors of Uniform Commercial Code, Article 2A, to recommend validation of similar constraints, including "shrink wrap" licenses, at the state level. See Uniform Law Commission, *Draft Revision of Uniform Commercial Code*, art. 2A, 2-2203 and Reporter's Notes; see also Raymond T. Nimmer & Patricia Ann Krauthaus, *Information as a Commodity: New Imperatives of Commercial Law*, 15 Law & Contemp. Probs. 103 (1992).

The difficulties of accommodating patent law to protect biotechnology have led an ever growing list of investigators to propose copyright protection as an alternative, on analogy to computer programs. See *supra* note 193.

452. See, e.g., Dreyfuss, *supra* note 10, at 898-905 (recognizing information products generally as unamenable to traditional intellectual property regimes, in part for lack of secrecy and lead time "because the sale of the products themselves usually reveals everything necessary to reproduce them at a cost equal to that of a developer"); Kingston, *supra* note 49, at 61 (stressing ease with which free-riders may appropriate information once it is embodied in product and put on market). The first to identify this as the crucial problem for computer programs was Galbi, *supra* note 55, at 281.

An innovative but unpatentable product of the new technologies thus tends to bear its know-how on its face.⁴⁵³ The innovator consequently risks becoming as vulnerable to rapid appropriation by second comers as the author of any published literary or artistic work.⁴⁵⁴ Like older forms of industrial design, the more recent applications of design process to such fields as computer programs, semiconductor chip products, and biogenetic engineering thus share a common pattern of economic behavior that deviates from the standard assumptions concerning artistic and industrial property covered by the dominant intellectual property paradigms. This pattern may be characterized as a proclivity to yield extraordinary financial rewards from incremental improvements in applied scientific and technical know-how that require considerable capital and effort to develop coupled with a high vulnerability to rapid duplication, by competitors able to override natural lead-time advantages without contributing, directly or indirectly, to the aggregate costs of developing the relevant technological regime.

What differentiates the cumulative strains afflicting the international intellectual property system at the end of the twentieth century from the tensions generated by such marginal cases as handtool and appearance designs at the end of the nineteenth century is that *incremental innovation bearing know-how on its face* has become a dominant characteristic of the most commercially valuable technologies in a post-industrial Age of Information.⁴⁵⁵ Meanwhile, this ongoing transformation of the industrial process has caused endless problems for the worldwide intellectual property system erected on very different legal and economic foundations. As long as investment in new technologies still produces types of innovation that are not unduly design-dependent or design-rich, the resulting prod-

453. See, e.g., Galbi, *supra* note 55, at 281 (stating that while a conventional manufacturer could "transfer the possession of a new machine without transferring the know-how involved in manufacturing the machine," anyone "who comes into possession of a computer program has all of the manufacturing know-how involved in creating additional identical computer programs"); see also Manifesto, *supra* note 61, at 2333-37, 2341-42 (nuancing this position with respect to later, more complex programs that present greater difficulties in decompilation). For similar views in regard to biotechnology, see, e.g., Purvis, *supra* note 186; Straus & Moufang, *supra* note 188.

454. See, e.g., Galbi, *supra* note 55, at 281 (stating that, although computer programs "produce[] economic benefits in somewhat the same manner that machines produce economic benefits," the technology of the program in use can "be duplicated in the same way that one creates and duplicates a literary work," and stressing dual nature of programs as both writings and functional parts of machine).

455. See Magnin, *supra* note 22, at 15-16, 121-26 (stressing inability of patent law to accommodate new technological know-how); Reichman, Programs as Know-How, *supra* note 274, at 648-68; see also Saxby, *supra* note 427, at 85-137. The chronic shortage of lead time afflicting the most promising new forms of nontraditional innovation has exacerbated the destabilizing effects of earlier marginal cases by the end of the twentieth century owing to their overall importance in post-industrial economic growth. See, e.g., Straus & Moufang, *supra* note 188, at 95-140. For future implications, see WIPO Symposium on Artificial Intelligence, *supra* note 247.

ucts and processes—whether patentable or not—appear to lend themselves to the conventional lead-time assumptions that classical intellectual property laws reinforce.⁴⁵⁶ When, instead, investment in research and development yields commercially valuable design solutions or other forms of technological know-how that transcend the “product-process” distinction, and such know-how becomes embodied on or near the face of the publicly distributed end products themselves,⁴⁵⁷ the conventional equilibrium between competition and imitation that classical trade secret law mediated begins to break down. Under these conditions, risk-averse investors readily succumb to real or exaggerated fears⁴⁵⁸ that a contraction of natural lead time will allow imitators, rather than innovators, to reap the rewards of successful innovation that falls chronically short of the established legal threshold for patentable inventions.

To the extent that a generalized contraction of natural lead time actually overtakes these cutting-edge technologies, it threatens to reinstate the conditions for a pervasive market failure like that which classical intellectual property law was supposed to eliminate.⁴⁵⁹ To avoid the resulting underinvestment in research and development likely to ensue, and to maintain the comparative trade advantages thought to flow from the production of high technology products and services,⁴⁶⁰ the world’s intellectual property system and the domestic competition laws with which it is allied have come under intense pressure from special interests seeking to obtain artificial lead time through one legal device or another. Governments responding to these pressures tend to alleviate the perceived risk of market failure either by deforming the patent and copyright laws in order to accommodate marginal subject matter for which they are inherently unsuited or by multiplying ad hoc grants of exclusive property rights that obscure the fundamental need to devise a more socially beneficial mode of protecting applied scientific know-how in gen-

456. See Levin et al., *supra* note 25, at 810.

457. See Manifesto, *supra* note 61, at 2335–36 (explaining importance of distinguishing locus of know-how “on or near” surface of increasingly dematerialized information artifacts).

458. While investors’ fears that lead-time advantages will become unduly curtailed under these circumstances are often founded on empirically valid factors, the tendency is to exaggerate the problem in order to press legislatures into providing overly protective responses that attempt to lock in temporary comparative advantages on domestic and foreign markets. See, e.g., Kastenmeier & Remington, *supra* note 59, at 437–61 (describing efforts to reconcile demands of integrated circuit manufacturers with public interest). See generally Litman, *supra* note 369, at 186–90 (protectionist tide in courts and Congress).

459. An empirically verifiable market failure of the kind foreseen in the text, corresponding to a conceptual breakdown of the classical intellectual property system diagnosed in this Article, would produce serious economic repercussions even if other justifications for intellectual property rights were more compelling than economists like to believe. See *supra* notes 384–385 and accompanying text.

460. See, e.g., Reichman, GATT Connection, *supra* note 8, at 754–61. See generally Reichman, *Beyond the Historical Lines*, *supra* note 18, at 97–109, 113–15.

eral. An integrated, more empirically based approach is needed to deal effectively with applied know-how in order to stabilize a discredited intellectual property system that still clings to a static notion of "industrial property."

B. *Portable Trade Secrets*

To the extent that governments ignore the contraction of natural lead time identified above, they sit on the sidelines and pray to the Invisible Hand for optimum levels of innovation while "free riding discourages investments necessary for innovation."⁴⁶¹ If, instead, the marketplace nominally reserved for free competition continues to fill with hybrid regimes of exclusive property rights—from utility model laws in the 1880s to semiconductor chip protection laws in the 1980s—it means that governments are reacting to the complaints of important industries that encounter stifling disincentives to investment in real life.⁴⁶² No pious incantation of free-market principles will reduce the high costs of investment that technical progress entails, nor will it lengthen short product cycles or neutralize technically refined methods of copying unpatented innovation.

By the same token, the evidence suggests that the hybrid regimes of exclusive property rights fail to solve the problem and may make it worse. For example, the sheer number and variety of the legal hybrids surveyed indicates that the world's intellectual property community has not yet found any satisfactory model regime, despite endless experiments with both modified patent and modified copyright approaches and despite repeated incursions into the misappropriation branch of unfair competition law as well. On the contrary, the two-hundred-year search for an appropriate intellectual property regime to protect industrial art (i.e., commercial designs) reveals only "a recurring, cyclical pattern that swings from states of chronic underprotection to states of chronic overprotection and then back to underprotection once again."⁴⁶³ Similar patterns have already begun to emerge in the much shorter history of industrial literature (i.e., computer programs),⁴⁶⁴ while even the less controversial regime protecting plant varieties has recently shifted from a modified copyright to a modified patent approach.⁴⁶⁵ Periodic lapses into unfair

461. Paepke, *supra* note 223, at 77. Paepke adds that "progress requires that an innovation occur before it can be imitated." *Id.*; see also Gordon, *supra* note 43, at 164.

462. Cf. *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141 (1989). One may ask why any future firm would develop the technologically advanced boat hull design at issue in this case if competitors can simply duplicate the result by the direct molding process, as this decision allows. Note that German, Italian, and Japanese utility model laws, as well as the United Kingdom's unregistered design right, could have protected this design.

463. Reichman, *Designs and Legislative Agenda*, *supra* note 143, at 287.

464. See, e.g., *Manifesto*, *supra* note 61, at 2357–64.

465. See *supra* notes 161–183 and accompanying text.

competition law only confirm the failure of these and other experiments.⁴⁶⁶

Unless intellectual property scholars lack skills that other legal and scientific investigators take for granted, one must consider the possibility that no principled, economically efficient regime of exclusive property rights in intangible creations can be developed outside the patent and copyright paradigms. Virtually all such regimes that human ingenuity has contrived seem to produce indefensible market distortions and inefficiencies outside a narrow range of ideal conditions. If hybrid regimes of exclusive intellectual property rights ultimately compound the barriers to entry that investors in incremental innovation must already surmount while disrupting the competitive marketplace on which both innovators and borrowers depend, it may mean that, apart from the patent and copyright paradigms, such rights inherently cost more in terms of social disutilities than they are worth.⁴⁶⁷

This analysis leads to a hypothesis that the hunt for such a regime may have constituted a false start all along, one that provides the wrong remedy for the wrong set of problems. In this connection, one may recall that as long as trade secret law successfully mediates between innovators and borrowers of traditional industrial creations, there is no perceived shortage of investment in incremental innovation. Nor would one expect investors to shy away from today's advanced applications of know-how to industry if the technical necessity of embodying the innovator's most valuable know-how in products distributed on the open market did not continually frustrate the operations of classical trade secret law. The crux of the problem that these hybrid legal regimes seek to remedy thus resides in the limits and shortcomings of classical trade secret law and not in the workings of the mature patent and copyright paradigms.⁴⁶⁸ If so, the quest for a lasting solution could turn on the elaboration of a better and more rational means of attaining the limited incentives of trade secret law than that body of law currently provides.

1. *Nature and Limits of Classical Trade Secret Law.* — When markets are the sole mediators between creators and borrowers of industrial innovation, trade secret law plays a more pivotal role than is commonly appreciated. As previously demonstrated, competition with respect to ordinary (i.e., unpatentable) innovation is rooted in the natural lead time that actual or legal secrecy initially provides and in the ability of consumers to

466. See text accompanying notes 197–223. Historically, the misappropriation branch of unfair competition law is itself a makeweight solution that signals the need for more formal legislative action.

467. To be sure, scholars of different stripes continue to debate even the relative inefficiencies of these dominant paradigms. See *supra* note 10.

468. That is, there appears to be a peculiar form of market failure, triggered by a lack of effective trade secret protection, and not a shortage of investment due to risks comparable to those inherent in prospecting for path-breaking discoveries or for artistic works that capture the public's fancy.

identify the sources of innovative products that trademark law later provides. Discussions concerning the extent to which trade secret law partakes of "property" or "tort" rationales⁴⁶⁹ thus obscure the fact that, with respect to unpatented innovation, laws protecting trade secrets and confidential information have actually determined the pace and direction of competition throughout most of the industrial revolution.

a. *A Market-Driven Liability Regime Regulating Investment in Incremental Innovation.* — A more revealing approach is to conceptualize classical trade secret law as a loosely codified, reciprocally beneficial set of default rules governing relations between originators and borrowers or users of unpatented, nondisclosed information that applies when the parties themselves have not entered any contractual agreement.⁴⁷⁰ In this exercise, it is helpful to disaggregate trade secret law into a set of functional components applicable to the products and processes that result from ordinary or routine engineering skills.

Viewed as a putative, standardized agreement between innovators and borrowers, trade secret law arguably allows second comers to use an originator's unpatented technical information if they contribute directly or indirectly to the community of innovators' overall costs of research and development. This contribution arises from the second comers legal obligation either to pay royalties under formal licensing agreements or to reverse engineer the originator's own achievements.⁴⁷¹ The task of reverse engineering unpatented, undisclosed innovation by proper means contributes to the innovative community's overall costs of research and development in ways worth noting in detail.

First and foremost, reverse engineering provides originators with an indispensable period of natural lead time in which to recoup their initial investment and to establish footholds in the market.⁴⁷² Second, it entitles fair followers who are willing to defray the costs of mastering an innovator's undisclosed know-how to compete on advantageous terms with the innovator by exploiting the cost reductions, technical improvements, and

469. See *supra* note 419.

470. Default rules work best in a context dominated by frequent transactional situations and where the contracting parties' needs may share a family resemblance, but are otherwise specific to each single negotiation. See, e.g., Todd D. Rakoff, *Social Structure, Legal Structure, and Default Rules: A Comment*, 3 S. Cal. Interdisciplinary L.J. 19 (1993).

471. Cf. Friedman et al., *supra* note 14, at 70 ("Ex ante the members of an industry might agree to allow reverse engineering of each other's products, knowing that all would have a net expected gain since reverse engineering frequently results in product improvements.").

472. The pivotal role of natural lead time in regulating the pace of competition on the general products market under classical trade secret law seems not to have attracted much attention until the advent of computer programs in recent years, even though computer programs merely repropose many of the same problems that were posed by industrial designs two hundred years earlier. See, e.g., Zentaro Kitagawa, *Summarizing the Berlin Symposium*, A.I.P.P.I. (Japan) 122-24 (1989).

new applications that reverse engineering reveals. The technical community as a whole thus benefits from self-help diffusion of unpatentable skills and knowledge, while each competing firm's implementation of the resulting improvements and new applications becomes one of the best means of undermining the goodwill lawfully accruing to the first comer's own trademark.⁴⁷³ Third, to the extent that the fair followers' improvements and new applications drive originators toward still further improvements of their own, the costs of this innovation are borne in part by the originators' previous investments in research and development, and in part by the contribution to total research and development from the fair followers' legal obligation to reverse engineer by proper means. Fourth, unfair followers who opt to reverse engineer by improper means nonetheless remain liable to contribute to the total costs of research and development whenever courts find that they have breached the standard agreement. In such cases, courts often measure liability by what the originator might have earned during the natural lead time when unfair followers would have been required to reverse engineer by proper means.⁴⁷⁴

Competition in the period between the Industrial Revolution and the Age of Information has hinged upon some variant of this standardized legal framework. To be sure, there were always marginal forms of innovation that escaped its reach, such as ornamental designs of useful articles and functional handtool designs, which competitors could duplicate without reverse engineering the novelty they embodied.⁴⁷⁵ However, reverse engineering of ordinary innovation generally was hard enough to tax the technical capabilities of would-be second comers seeking to discover undisclosed information; except at the margins, such innovation was not readily susceptible to free-riding appropriation of the investments required to produce it.⁴⁷⁶ One historical justification of the patent system indeed was to reward entrepreneurs with exclusive property rights in exchange for their willingness to teach routine engineers the patentable techniques needed to elevate competition to its next high-

473. Cf. Friedman et al., *supra* note 14, at 67 (stressing benefits of shared information that result from legal obligation to reverse engineer by proper means).

474. See, e.g., Roger M. Milgrim, *Milgrim on Trade Secrets*, § 15.02[3] (1993) (citing authorities and noting exceptions). Injunctive relief, when available, is also usually limited in duration to the estimated period required for reverse engineering, that is, the lead-time period that was neutralized by a wrongful taking of the secret. See *Integrated Cash Management Servs. v. Digital Transactions, Inc.*, 920 F.2d 171, 174-75 (2d Cir. 1990) (former employees prohibited from developing software similar to that of employer for six months only, but permanently enjoined from using program already in existence at time initial injunction was granted); Milgrim, *supra*, § 15.02[1][d].

475. The vulnerability of these types of innovation to instant duplication by free-riders exerted pressure on unfair competition law in most industrialized countries and eventually gave rise to two of the oldest legal hybrids, namely, ornamental design protection laws and utility model laws.

476. Cf. Levin et al., *supra* note 25.

est level.⁴⁷⁷ By the same token, the difficulties of reverse engineering by proper means often induce second comers to forego the privileges of the standard trade secret regime in favor of tailor-made licensing agreements with originators. These nonstandard agreements typically require second comers to contribute directly to the originator's cost of research and development in return for both disclosure of the unpatented know-how in question and the right to use it in specified competitive endeavors.⁴⁷⁸

These tailor-made agreements inevitably privilege the licensee who purchases undisclosed information with respect to both the originator-licensor, who fears the licensee's potential as a future competitor, and with respect to other fair followers, who must still overcome technical obstacles along the path of reverse engineering in order to compete at all. Licensors may, therefore, respond by imposing harsh express conditions that, for example, limit the licensees' rights to compete with the originators from whom they acquired the secret information and that require licensees to share any improvements and new applications they may devise with licensors.⁴⁷⁹

Logical as such terms may seem, they often call the public interest into question precisely because the licensee is not a free-rider at all but rather one who has expressly agreed to pay his or her share of the costs of research and development in the form of negotiated royalties. Because the licensee has bought and paid for this mastery of the technical know-how, he or she becomes uniquely qualified to adapt, transform, improve, and extend the unpatented innovation in question. These skills, properly harnessed, can provide consumers with better and more efficient products than those of the originator. Even though licensees seeking access to markets may succumb to onerous limitations on their freedom of action in order to obtain needed technical information, courts and administrators mindful of the public interest in competition may free the licensee from some of these constraints under various doctrines of abuse sounding in the laws of trade regulation.⁴⁸⁰ Government intervention along these lines usually seeks to neutralize the right of a licensor to prevent a licensee from eventually acceding to the status of an unlicensed second comer who can freely borrow unpatented technical information in furtherance of his own innovative endeavors without paying additional tribute to the licensor-originator.⁴⁸¹

477. See, e.g., Cheung, *supra* note 36, at 40–41; Lehmann, *supra* note 1.

478. See Cheung, *supra* note 36, at 45–46; Dreyfuss, *supra* note 24, at 68–69.

479. See Milgrim, *supra* note 474, §§ 10.01[2][f], [m].

480. See generally *id.* § 10.01.

481. The tendency in the United States is to apply a rule of reason to most licensing transactions questioned on grounds of antitrust principles. See, e.g., Raskind, *supra* note 17. Japanese and European Community law have given greater formal attention to know-how transactions as such when applying antitrust principles, but with mixed results. See, e.g., Reichman, *Beyond the Historical Lines*, *supra* note 18, at 88–90 (citing authorities).

At the international level, the public interest in regulating two-party know-how transactions is sometimes characterized in terms of ensuring an effective transfer of technology, particularly from developed to developing countries.⁴⁸² It seems sounder and more accurate, however, to cast the problem in terms of users' rights to use unpatented technical information once they have acquired it by proper means. Here difficulties arise in part because there is no consensus in the domestic laws concerning the appropriate balance between originators' and users' rights and in part because the transaction costs of policing myriad tailor-made deals become too high.⁴⁸³ Except when administrators find some rule of thumb to reduce these transaction costs, states tend to paint with a broad legal brush that errs either on the side of under- or overregulation. One frequently used rule of thumb that helps to maintain a workable balance in regulating know-how licensing agreements is that of a rather short term of duration, which operates as a substitute for natural lead time.⁴⁸⁴ Arguably, so long as the licensing agreement lasts a relatively short time, it should allow a licensor to extract more during the life of the contract while permitting the licensee greater freedom to use what he or she has paid to learn thereafter.

This discussion has emphasized that classical trade secret law functions as a loosely codified set of default rules that impose compensatory liabilities for socially undesirable conduct, and not as a regime of exclusive property rights. This regime can be viewed as an off-the-rack agreement regulating the rights of private innovators and borrowers to use unpatented innovation in the public interest.⁴⁸⁵ Even though single competitors can usually contract around this common set of default rules, at least within the confines that the domestic competition laws lay down, the liability regime in question constitutes a true law of users' rights. The logic of this regime endows all members of the community of innovators with a conditional right to use each other's unpatented, undisclosed information, provided that users directly or indirectly contribute to the collective costs of research and development. Moreover, this regime fosters a high degree of market-driven, pro-competitive business activity by allowing potential users autonomously to choose whether to pay such con-

482. See Reichman, *Beyond the Historical Lines*, *supra* note 18, at 90 & n.61.

483. See, e.g., Cabanellas & Massaguer, *supra* note 372, at 65-242; Teruo Doi, *Intellectual Property Protection and Management Law and Practice in Japan* 303, 309-40 (1992); Reichman, *Beyond the Historical Lines*, *supra* note 18, at 89 (citing authorities).

484. Cf. Cabanellas & Massaguer, *supra* note 372, at 138-39, 157-67.

485. Professor Ian Ayres distinguishes "off-the-rack" defaults from "tailored" defaults. The latter conditions legal treatment on particular attributes or conduct of the contracting parties. The former or untailored defaults are rule-like because they remain contingent on fewer variables. In using the term "off-the-rack" to describe a contractual gap filler or default rule that applied to all contracting parties, Ayres notes that when the rule does not fit, the contracting parties must change it by an explicit provision. See Ian Ayres, *Preliminary Thoughts on Optimal Tailoring of Contractual Rules*, 3 *S. Cal. Interdisciplinary L.J.* 1, 4 (1993).

tributions directly (in the form of royalties), or indirectly (through the costs of reverse engineering), depending on the borrowers' own best estimate of the costs and benefits likely to flow from either decision.⁴⁸⁶

b. *Limits of the Standard Regime and the Threat of Market Failure.* — The foregoing analysis confirms that market economies, whose growth derives from constant innovation, actually depend on the interaction between trade secret law and the operations of a mature patent system. The patent system elevates the level of routine competition to its next highest stage and permits the market, with relative efficiency, to allocate resources to the task of transferring the fruits of path-breaking research to industry.⁴⁸⁷ At the same time, classical trade secret law regulates the pace and direction of ordinary competition, built upon routine or incremental innovation by: (1) providing natural lead time, (2) requiring second comers to share directly or indirectly in the costs of research and development, and (3) avoiding abusive licensing constraints on the use of unpatented information. This standard formula for healthy competition breaks down under modern conditions, however, because of the generalized contraction of lead time in the commercialization of applied know-how identified above, which constitutes the most distinctive property of the class of phenomena under investigation. As a result, free-riders can rapidly appropriate the know-how applied to tangible products sold on the open market by duplicating the information they contain with no corresponding investment of their own and without adding to the store of cumulative, sequential improvements and new applications.⁴⁸⁸ The economic effects of this incipient market failure are then aggravated by the ability of these same free-riders to avoid making any direct or indirect contributions to the innovative community's overall costs of research and development.

In the short run, of course, consumers may benefit from the second comer's avoidance of these costs in the form of lower prices. Any long-

486. Among the prominent justifications or criteria for fashioning default rules, the promotion of communitarian values and efficiency ranks high. See, e.g., Steven J. Burton, *Default Principles, Legitimacy, and the Authority of a Contract*, 3 S. Cal. Interdisciplinary L.J. 115, 133, 139 (1993); see also Friedman et al., *supra* note 14, at 67–71 (stressing reciprocity of interests arising from fact that “every producer of information is also a consumer of information—the basic input into the production of information is information” and claiming that trade secret laws have “surprising efficiency properties”); Alan Schwartz, *The Default Rule Paradigm and the Limits of Contract Law*, 3 S. Cal. Interdisciplinary L.J. 389, 415 (1993) (default rule paradigm is devised to focus attention on importance of context). This Article makes no claim of efficiency, but only that trade secret laws are inherently pro-competitive because outcomes are entirely the product of multiple business decisions over which no individual has control. Cf. Calabresi & Melamed, *supra* note 29, at 1096–97.

487. See, e.g., Kitch, *supra* note 416, at 266, 275–280; Lehmann, *supra* note 1, at 12.

488. Under modern conditions, in other words, a major problem with the kinds of innovative know-how underlying important new technologies is that they often do not lend themselves to secrecy even when they represent the fruit of enormous investment in research and development.

term solution to the problem of applied know-how, therefore, must take this benefit into account, including any socially productive savings that arise if second comers avoid wasteful or duplicative research and development inherent in the obligation to reverse engineer. Even though trade secret law tends to elicit pro-competitive decisions, one should not automatically assume that reverse engineering is always the most efficient or most socially desirable option for a community of innovators to impose upon the borrowers in its midst.⁴⁸⁹

Nevertheless, the second comer's ability to apply the borrowed know-how to products that sell for less than the originator's average costs aggravates the disincentives to invest in unpatentable innovation that already derive from a chronic shortage of natural lead time, while the second comer who takes this route will not have enhanced the technical capabilities of the innovative community as a whole. If the competitive balance that trade secret law normally maintains tips too far in favor of borrowers, innovators unable to qualify for patent protection will take socially undesirable measures to defend themselves from the attendant risks. Over time, familiarity with the perils of free-riding will adversely influence the future investment decisions of the entire community of innovators, even though most of its members alternately occupy the positions of both innovators and borrowers under standard operating conditions.

For example, innovators may simply reduce the level of investment in overall research and development and delay projects to improve their products in the hope that diminishing returns from existing innovation will at least help to offset the costs of past innovation.⁴⁹⁰ To the extent that other innovators reduce their investment in response to similar fears, product cycles will artificially expand, especially if the market was already subject to oligopolistic pressures. Innovators may also decide to invest primarily in forms of marginal differentiation that keep them within the mainstream and yet enable them to strengthen market identity without significantly enhancing either the costs of past innovation or the risk of appropriation.

A more aggressive alternative strategy could drive some innovators to invest more in path-breaking or deep technological research capable of yielding patentable discoveries than would be the case if lead time and free-riding appropriation were factors of less importance. This strategy

489. For example, reverse engineering may become inefficient when the second comers can reach equal or better results merely by extending their existing skills and knowledge with relatively little effort, or when they were about to reach similar results by their own means. It may also be less efficient than direct licensing. A default, quasi-liability regime leaves these decisions to the relevant community of innovators and borrowers who know what is best for themselves. See *infra* text accompanying note 527.

490. In effect, yesterday's innovator may thus convert to borrower status reluctantly, despite greater capacity to innovate, because he "feels that the cost of successful copying may be lower than the cost of the original effort" to innovate. See Cheung, *supra* note 36, at 47.

entails high risks of its own, however, because the success of the venture is never certain, and others may either beat the inventor to the patent office or enter the market with innovation that destroys novelty or weakens the case for nonobviousness. Moreover, information-based technologies have so blurred the distinction between theoretical and applied science that it casts doubt on the ability of these disciplines to yield truly "nonobvious" discoveries in the strict patent sense, except at some unacceptably high level of abstraction, such as algorithms and mathematical formulas. Many observers believe that the standard of nonobviousness has itself been declining throughout the Western world in order to rescue incremental innovation in important new technologies that find no shelter under the dominant legal paradigms. By the same token, administrators may ease their scrutiny of two-party know-how licensing agreements and permit innovators to impose harsher measures on those second comers who opt to pay for access to more fundamental advances.⁴⁹¹

The vulnerability of applied scientific know-how to rapid appropriation thus skews both the pace and direction of innovation in the event that classical trade secret law becomes unable to perform its mediating function. Absent government intervention to cure market failure by the provision of artificial lead time in one form or another, conditions arise in which would-be innovators become less inclined to invest because second comers can too quickly and too cheaply obtain the fruits of their investment. At the same time, second comers become less prone to invest in more than marginal differentiation because originators can return too quickly to the market with copycat versions of more significant improvements or extensions. Lacking the minimum conditions for healthy competition that trade secret law provided in the past,⁴⁹² the market for unpatented innovation becomes overheated and subject to strategic responses inconsistent with an environment favoring long-term investment in more socially beneficial forms of innovation.

c. *The Public Interest Overwhelmed.* — The advent of information-based technologies has also unsettled doctrines of competition law that heretofore regulated the contractual conditions that licensors could impose on licensees willing to pay for the acquisition of undisclosed know-how.⁴⁹³ Paradoxically, the tensions here pull in opposite directions.

On the one hand, the vulnerability of new technologies to rapid appropriation means that legal constraints on licensing technological know-how that were sensible in the past may prove inefficient today. Entrepre-

491. Cf., e.g., Valentine Korah, EEC Licensing of Intellectual Property, 4 *Fordham Intell. Prop., Media & Ent. L.J.* 55, 79–80 (1993) (acknowledging a more laissez-faire attitude toward know-how agreements subject to EEC regulation, but doubting that a "rule of reason" approach would ever be congenial to European mentality).

492. Cf. Cheung, *supra* note 36, at 44 (provided that reverse engineering is neither too easy or too hard, there "is a spectrum of inventive activities for which legal protection of trade secrets is to some degree effective").

493. See *supra* notes 477–481 and accompanying text.

neurs faced with a chronic shortage of natural lead time will logically fear the superior competitive position that potential licensees may occupy after gaining access to undisclosed information. For example, manufacturers of digital technologies may impose conditions limiting either the licensee's right to reverse engineer or his use of improvements and adaptations resulting from privileged information that exceed the normative limits of traditional intellectual property and antitrust laws.⁴⁹⁴ Yet, the failure of the world's intellectual property system to address the problem of incremental innovation bearing know-how on its face often makes such defensive contractual measure both necessary and, depending on the facts, economically reasonable as well. The traditional doctrines of misuse, such as they are, cannot automatically be applied to promote competition in new technologies without the risk of exacerbating the problems caused by a chronic shortage of natural lead time.⁴⁹⁵

On the other hand, widespread use of electronic information tools has paradoxically increased the power of certain publishers to subordinate even the use of disseminated information to two-party agreements that override public-interest limitations on contractual rights normally available under the domestic copyright laws. For example, even when dissemination occurs in hard copy form, such as a CD-ROM, digital technology enables publishers of databases who constantly update their data to charge, directly or indirectly, for all uses, and to override privileged uses accorded to libraries and noncommercial researchers under copyright laws.⁴⁹⁶ Without safeguards to foster certain socially beneficial uses of information at acceptable costs, the privatization of information could thus retard technological progress. Yet, it remains to be seen whether courts and legislators can devise unconventional public policy limitations on either the statutory protection of private licensing of electronic information tools or applied know-how in general that are better suited to modern conditions than the traditional norms protecting the public interest, including the doctrine of misuse.⁴⁹⁷

494. Compare, e.g., *Lasercomb America, Inc. v. Reynolds*, 911 F.2d 970, 978 (4th Cir. 1990) (developer "has the right to protect against copying" of codes, but restrictions on licensee cannot be so broad as to operate in a "manner adverse to the public policy embodied in copyright law") with *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 156-157 (1989) (reaffirming that trade-secret licensing agreements cannot provide "patent-like protection to intellectual creations which would otherwise remain unprotected as a matter of federal law"); see also Dreyfuss, *supra* note 24, at 718-46; Rice, *supra* note 451, at 595-621.

495. See Reichman, *Beyond the Historical Lines*, *supra* note 18, at 87-94 (concluding that uncritical applications of traditional misuse doctrines to licensing of nontraditional innovation will lead "courts down a zig-zag path between intermittent states of excessive intervention and mindless judicial restraint").

496. See, e.g., OTA Report 1992, *supra* note 365, at 166-79.

497. See generally Reichman, *Electronic Information Tools*, *supra* note 48, at 461-67 (analyzing tension between public interest and two-party contracts).

The common thread uniting these trends is the growing inability of courts and administrators to defend the public interest through traditional legal processes that require weighing the efficiency of particular contractual conditions under a case-by-case rule of reason analysis. The potential costs of scrutinizing the tens of thousands of questionable transactions pending at any given period are daunting. The lack of consensus concerning the proper application of competition law to know-how licensing agreements even under standard operating conditions exacerbates this problem, while courts and administrators are bewildered by the difficulties of extending these uncertain, pre-existing norms to new technologies that do not lend themselves to secrecy. Beyond these complications, one may question the ability of decisionmakers who proceed case-by-case to distinguish licensors' restrictions which, though harsh in terms of traditional law, appear efficient under the circumstances, from situations in which the public interest would benefit more from the licensees' freedom to adapt and to improve the products in question on a par with outside competitors.⁴⁹⁸

Courts and administrators thus face a troubling dilemma. If they strictly scrutinize know-how agreements with a view toward assessing their anticompetitive effects, high transaction costs will further burden investment in research and development, the pace of innovation may be retarded to suit bureaucratic convenience, and free-riding practices may further depress the availability of venture capital. If, instead, administrators adopt a lax attitude that allows most two-party know-how transactions to obtain provisional approval without scrutiny, licensees willing to pay for the disclosure of particular technological advances may find themselves seriously disadvantaged compared to nonlicensees, some of whose decisions to reverse engineer were arguably less efficient under the circumstances. Moreover, a lax attitude allows oligopolies controlling key technologies to retard incremental innovation by parties using proper means and may thereby create formidable barriers to entry.

These capability problems are part of the larger challenge that applied scientific know-how poses for the world's intellectual property system. At bottom, pretending to defend the public interest by subjecting individual know-how transactions to a rule-of-reason analysis becomes an excuse for abandoning the public interest to protectionist interests. It is as inherently inefficient as the practice of casually bestowing bundles of exclusive rights on new subject-matter categories with no solid theoretical or economic justifications.

2. *A Rationalized Menu of Liability Options.* — The failure of classical trade secret law satisfactorily to balance the interests of innovators and borrowers in markets for important new technologies (and especially for information-based goods) accounts both for recent tendencies to deform the patent and copyright paradigms and for the proliferation of legal hy-

498. See *supra* notes 491–495.

brids.⁴⁹⁹ Governments have intervened to correct a perceived threat of market failure by providing innovators with artificial lead time and with temporary monopolies that restrict the second comers' abilities to use the know-how embodied in products sold on the open market. However, the various decisions to provide innovators with hybrid grants of exclusive rights and the different technical modalities used to implement them do not appear to rest on firm theoretical or empirical foundations. Rather, they are the combined products of failed experiments with respect to industrial designs in the past, intuitive estimates of fairness and of industry needs, the influence of special-interest lobbying on legislators in virtually every jurisdiction, and recent efforts to disguise barriers to international trade as intellectual property rights despite the contrary strictures of international economic law.⁵⁰⁰ To the extent that hybrid legal regimes built around grants of exclusive property rights actually produce efficient results—a thesis that has never been demonstrated—one can determine the existence of these results only after the fact and as an accidental consequence of veiled appeals to natural justice and national self-interest.

The exclusive rights regimes as a class are inherently more anticompetitive than the trade secret laws whose defective operations they seek, wittingly or unwittingly, to redress, because the latter impose no insuperable barriers to entry.⁵⁰¹ In practice, classical trade secret laws allow the market to determine the value of any particular innovation, and no extrinsic criterion of merit or social desirability skews the individual investor's assessment of market prospects. Moreover, these laws invite all second comers to choose whether to reverse engineer or to seek licenses based on their own cost-benefit analyses, which include assessments of their existing research capabilities in relation to future market prospects. In either case, as long as the task of reverse engineering proves neither too hard nor too easy, investment strategies affecting the pace and direction of innovation that result from these individual assessments of market prospects are as procompetitive as the free-market system permits.

499. The earliest known authority clearly to perceive the link between the irrationalities of trade secret law and the function of hybrid legal regimes was Professor John C. Stedman, who in 1962 had already called for a more rational trade secret policy in this regard. See Stedman, *supra* note 13, 24–27. Stedman, however, had designs and utility models in mind, see *id.* at 28. No one at that time could have foreseen the deeper implications of this problem until the advent of computer science and biogenetic engineering converted the irrationalities of trade secret law into a potential black hole that threatens to reduce the pace of technological evolution. The earliest known investigators to intuit the implications of insufficiently protecting cutting-edge know-how of this kind in trade secret law were Galbi, *supra* note 55, and Magnin, *supra* note 22, in 1969 and 1974, respectively. For later insights in the literature, see *infra* note 507.

500. See, e.g., Reichman, GATT Connection, *supra* note 8, at 834–36, 888–89.

501. See *supra* notes 486–490 and accompanying text. The total social costs of the two regimes must nonetheless be compared. See *supra* notes 410–424 and accompanying text.

The exclusive rights regimes implicitly direct beneficiary firms to adopt certain strategies, favored at the time of legislative action, that tend to maximize the profits from exploiting the relevant legal monopolies. But follow-up investigations are rarely carried out to determine which business strategies would actually benefit firms the most under the circumstances they actually face, nor are the underlying hypotheses about putative social benefits ever verified empirically. For example, the exclusive rights regimes may compel second comers to abandon research and development already under way, to strike out in new directions against their will, to pay licensing fees in order to avoid artificial barriers to entry, or to litigate in order to elude oppressive demands for tribute. Yet, because the erection of these barriers does not result from any credible economic analysis tending to demonstrate their relative efficiency, these responses are likely to prove market-distorting except when a priori estimates of the desirable balance between innovators and borrowers happen to coincide with market-determined outcomes. Requiring second comers to base investment decisions on arbitrary extensions of monopoly power rather than on private economic analyses of their technical capabilities to reverse engineer by proper means thus seems to ensure that, viewed collectively, these investment decisions will prove less efficient than comparable decisions under classical trade secret law.

More generally, regimes of exclusive property rights seem better suited to organizing investment in relatively large-scale innovation than in small-scale innovation. For example, patents help to overcome the high risk-aversion associated with the prospecting function of developing markets for major new discoveries and they facilitate allocation of the resources needed to transform these discoveries into downstream industrial applications. Copyrights attract investment in the costly dissemination of literary and artistic works, despite the risks inherent in prospecting the public's taste. Exclusive property rights seem to serve these functions tolerably well.⁵⁰²

In contrast, small-scale sequential innovation occurs because markets have already formed and consumer needs evolve within the relevant technological paradigms. Competition tends to satisfy these needs without the cultural baggage and cumbersome legal machinery of intellectual property rights provided that the single participating firms enjoy a modicum of natural lead time.⁵⁰³ Hence, the public interest focuses on maintaining minimum but adequate levels of lead time conducive to overall investment and not on the decisions or practices of individual investors or producers, which remain essentially market-driven. Under trade secret law, the single investors can never bring suit to enforce specific, pre-determined legal outcomes, but only to repress particular types of conduct that threaten the public interest in maintaining lead time in general.

502. See Kitch, *supra* note 416, at 275-80.

503. See *supra* text accompanying notes 407-409.

The requisite legal machinery, therefore, becomes simpler than that of the hybrid regimes, and the resulting transaction costs are likely to be lower.

In this connection, the claim that exclusive property rights in small-scale innovation promote private licensing transactions is seductively misleading. The transaction costs of implementing regimes of exclusive property rights covering small-scale innovation, and the resulting barriers to entry, appear disproportionately high in relation to the median social value of the technical contributions in question. More to the point, if the goal is to stimulate the licensing of incremental innovation at the lowest social costs, the best way to achieve it is to build a provision for automatic licensing into the very fabric of a liability regime that emulates the functions of trade secret law itself.

Of course, one must take account of the social costs peculiar to trade secret law, including those associated with the vagaries of secrecy itself and the arbitrary or capricious outcomes it sometimes engenders. While the presence of lead time always stimulates competition, investment flows where the potential for secrecy draws it. Yet, there is no necessary or logical correlation between the social value of the innovation that benefits from secrecy and that which does not.⁵⁰⁴ To the extent that today's most important knowledge-based industries depend on information as a raw material and on design as the basic technique of cumulative and sequential innovation, the likelihood is that, in the raw state of affairs, trade secret law will disfavor investment in some of the most socially desirable pursuits.

That is precisely the point of the exercise. The task of rationalizing trade secret policy, which Professor Stedman thought already overdue in the 1960s,⁵⁰⁵ has become imperative for all countries whose comparative trade advantage depends on maintaining the flow of investment to incremental innovation bearing know-how on its face. Free-market economies rely on trade secret laws (or equivalent laws of confidentiality) not because these laws operate rationally, but because no other legal machinery has been available.⁵⁰⁶ Now that classical trade secret law threatens cutting-edge technologies with a chronic shortage of lead time, legal theory

504. See *supra* notes 424-427 and accompanying text.

505. See Stedman, *supra* note 13, at 26 (reliance upon contract law, employment law, fiduciary relationships, unfair competition, and equitable principles prevents development of "a considered and articulate trade secret policy that can serve as a sure guide in deciding whether protection in any given situation should be greater or less, granted or denied").

506. We find ourselves . . . falling into a position where, because the legal grounds upon which to base such decisions are conveniently at hand, we *protect* trade secrets to the extent that they are kept entirely secret, are not used and are not disclosed, but *deny* protection (presumably because we cannot find acceptable legal doctrine in . . . collateral fields of law . . . to support the contrary position) where the information has been publicly disclosed

Stedman, *supra* note 13, at 27.

must devise means to improve on nature by rationalizing the delivery of the pro-competitive functions that this body of law is supposed to perform. In other words, reformers must identify the socially valuable functions that trade secret law performs and transplant these functions to a different legal matrix capable of performing equivalent functions without being dependent on the accidents of secrecy or the lack of it.

Such a project, however, is a far cry from the current practice of multiplying hybrid regimes of exclusive intellectual property rights or deforming the patent and copyright paradigms to accommodate objects of protection for which they were never intended. This rising protectionist tide could so burden the innovative enterprise with hidden costs that would not have been incurred under trade secret laws as to slow the pace and skew the direction of innovation more than would otherwise occur if free-riders were left alone. Yet with regard to unpatented, noncopyrightable applications of technical know-how to new industrial products, grants of exclusive rights that create barriers to entry seem altogether unjustified if the constraints on innovation at issue stem more from market disfunctions attributable to the absence of lead time than from technological barriers requiring substantial resources and uncommon inspiration to overcome. Indeed, the only "rewards" needed in this milieu are those that the market would provide were it capable of overcoming these same disfunctions.

If this hypothesis proves correct, the solution lies in curing the market failure in question by means of compensatory legal devices that restore and enhance competition as it would have evolved in the presence of an effective trade secret law. In other words, if classical trade secret law cannot satisfactorily cope with incremental innovation bearing know-how on its face, the simplest remedy may lie in convincing the relevant community of innovators and borrowers to accept a substitute regime that provides some functional equivalent of what trade secret law provides under optimum conditions. As will be seen, this analytical thread leads to the elaboration of an off-the-rack set of quasi-liability rules and not to another round of exclusive property rights.

a. *Off-the-Rack Liability Rules Allocating Contributions to the Cost of Research & Development.* — The findings set out in this and other studies demonstrate the need to elaborate a general purpose innovation law capable of regulating publicly distributed embodiments of technical know-how that neither patent, copyright, nor classical trade secret law adequately protect.⁵⁰⁷ A universal innovation law built along these lines

507. For early recognition of the need for an innovation law to mediate between patents and free competition, see Kingston, *supra* note 49, at 59–86 (innovation warrants needed to encourage investment at above average risk); *id.* at 35–58 (discussing Kronz's "innovation patent"); Kronz, *supra* note 384; see also Stedman, *supra* note 13, at 28, 32 (recognizing inability of trade secret law adequately to protect many forms of unpatentable innovation, including designs, as well as noncopyrightable data collections, and recommending *sui generis* law to protect small inventions, like German utility model laws);

would solve the free-rider problem facing growing numbers of investors in applied know-how by directly linking the prospects for short-term returns on investment to the stipulation of a standard, multi-party set of default rules applicable to eligible forms of innovation. This "portable trade secret" regime, loosely derived from classical trade secret lore and from antitrust principles applicable to two-party transfers of unpatented industrial know-how, aims to avoid market failure without introducing the market distortions characteristic of intellectual property rights and without forfeiting the pro-competitive social benefits that result from classical trade secret laws under optimum conditions.

One can structure such a regime to achieve several important goals. First, it must provide qualified innovators with a modicum of artificial lead time, even after public distribution takes place, and not require secrecy, simply because competition presupposes lead time.⁵⁰⁸ Second, a default liability regime can ensure that second comers, who appropriate unpatented know-how for their own uses soon after the innovative product embodying it appears on the market, contribute directly or indirectly to the overall costs of research and development. Third, it can calibrate the schedule of liability costs for unauthorized borrowing of this kind in ways that encourage socially desirable uses, such as improvements and new applications, and it can distribute fees paid under this schedule in ways that support those innovators whose contributions mattered in terms of consumer response. Fourth, such a regime can so attune the menu of liability options it affords to the public interest at large as to exempt those abiding by its rules from further scrutiny under applicable principles of antitrust law except in extraordinary circumstances.⁵⁰⁹

Some countries have already moved in this direction by adopting *sui generis* regimes built on liability principles. This appears from the recent use of unfair competition law to protect new technologies in Switzerland, or simply new product configurations in Japan, and also from the much earlier regime protecting engineering projects in a law related to the Ital-

Richard Stern, *The Bundle of Rights Suited to New Technology*, 4 U. Pitt. L. Rev. 1229 (1988). This Article, instead, proposes a set of quasi-liability rules, loosely derived from principles of trade secret law that break with the exclusive property rights tradition. Cf. Calabresi & Melamed, *supra* note 29; *supra* text accompanying notes 52-54. For theoretical approaches having affinities with the proposals set out in the text, see Dreyfuss, *supra* note 10, and Gordon, *supra* note 43, at 159-62.

508. Whether disclosure of the know-how should be required is a separate and closer question. See *infra* text accompanying notes 549-553. In principle, this author believes that full disclosure need not be required as long as the duration of protection remains short. Innovators would thus retain the option of invoking either the proposed liability regime or classical trade secret law if they assumed the risks. However, if longer periods of protection were granted, like the twenty-year term for engineering projects in Italian law, then disclosure should become mandatory, as Professor Paolo Spada suggested in an unpublished communication with the author.

509. See *infra* text accompanying notes 553-557. The default liability rules would thus incorporate their own "rules of reason" for these purposes.

ian copyright regime. However, the Japanese and Swiss exemplars do no more than provide lead time, while the Italian neighboring right attempts to do so much that its twenty-year term of compensation hardly qualifies it as a lead time law at all. If the latter solution provides too much compensation and no blocking effect, the rigid Japanese model provides an arguably excessive blocking effect with no attenuating compensation, and the Swiss law is so lacking in structural legal criteria as to defy sound judicial implementation.⁵¹⁰

In effect, the misappropriation laws pursue only some of the goals identified above. Yet, those were goals worthy of a proper know-how law in the abstract, and trade secret laws managed to fulfill most of them under optimum conditions. Above all, the drafters of these experimental liability regimes seem much too preoccupied with individual transactions—the single-shot deal—and do not sufficiently take the needs of the technical community—as a collective actor—into account.⁵¹¹

Default liability rules that improve on existing trade secret laws should make these communitarian needs their primary focus. These rules should promote the interest of the relevant technological community as a whole and the larger public interest with which they must be reconciled. By the same token, default liability rules that advance the interests of the technical community without harming the public interest seem certain to further the public interest merely by advancing the cause of incremental innovation more than existing regimes.

Determining the interest of the technical community initially requires a recognition that most of its members do not pertain immutably to either the category of innovators or that of borrowers; they shift back and forth between these categories at different phases in the evolution of particular types of innovation. Hence, in restoring the kind of competitive marketplace that encourages innovators to invest in research and development, an innovation law should not unduly discourage second comers from using the fruits of such investment in sequential and cumulative innovation of their own.⁵¹²

In this respect, incremental innovators depend on their predecessors in ways that are more reminiscent of artistic creators than of path-breaking inventors. Like artistic creators who forge new works from yesterday's creations only to see these become the source of further creations tomorrow, all incremental innovators borrow from past innovation while seeking those design variations and improvements that define progress in particular market segments and that permit single entrepreneurs to es-

510. See *supra* text accompanying notes 209–218.

511. On the theory of collective action, see generally John R. Commons, *The Economics of Collective Action* 21 (1970); John R. Commons, *Institutional Economics: Its Place in Political Economy* 58 (1959); Glen W. Atkinson, *Political Economy: Public Choice of Collective Action?*, 17 *J. Econ. Issues* 1057, 1060 (1983).

512. See, e.g., Landes & Posner, *supra* note 16, at 268–70.

tablish niches in crowded markets. Today's innovators thus borrow the results of yesterday's investment in research and development even as they stimulate tomorrow's innovators to borrow from them in the course of developing improvements, adaptations, new applications, and extensions of existing technology.⁵¹³

As matters stand, innovators who apply scientific know-how to publicly distributed useful articles will tend to innovate less because second comers find themselves in a position to borrow too much too soon. But second comers will have little new to borrow if innovators decline to innovate. As time goes on, moreover, most members of the relevant innovative communities alternate or combine the roles of innovator and borrower and seldom know in advance which status will best suit their needs, at any given time. Each therefore shares a common interest in devising an off-the-rack set of liability rules capable of instituting a more desirable balance between these two roles than occurs under existing legal regimes.⁵¹⁴

If the loosely codified liability rules embodied in nineteenth-century trade secret laws no longer adequately balance the interests of innovators and borrowers in a socially productive manner, the community of innovators as a whole requires an agreed upon, substitute mechanism that readjusts the balance between these relationships. To maximize efficiency, this re-adjustment must enable all comers to profit from both current and prior contributions to the creative endeavor while still allowing the market to determine the value of specific embodiments of incremental innovation bearing know-how on its face. In order to achieve these goals, innovators *qua* innovators must agree not to borrow the product of another innovator's investment in research and development except on socially beneficial conditions that are reciprocally satisfactory to the community of innovators as a whole. By the same token, borrowers *qua* borrowers must commit to paying reasonable compensation to innovators for their investment in research and development when they borrow the results of that investment within a socially productive and mutually acceptable period of time.⁵¹⁵ Holdouts who refuse to accept a negotiated, community-wide transaction can nonetheless be assimilated to the relevant technical community for certain purposes, and can even be judicially re-

513. See, e.g., Friedman et al., *supra* note 14, at 67 ("[E]very producer of information is also a consumer of information.").

514. See Commons, *The Economics of Collective Action*, *supra* note 511, at 29, 109 (the uncertainty of the future contributes to a "negotiation psychology" in the "give and take process of conciliation and agreement" and leads to collective agreements concerning "future rules that will be followed").

515. Collective action theory requires that individuals subject themselves to collective restraints on their own dealings if in the long run it will promote the greater collective interests and fairness. See Atkinson, *supra* note 511, at 1062.

strained from contracting out of baseline provisions deemed to promote both the public interest and that of the relevant technical community.⁵¹⁶

Because incremental innovators operating outside the patent system in the pursuit of today's important new technologies risk being inadequately served by classical trade secret law at least some of the time, they share a common interest in adopting a compensatory mechanism in order to restore the bases of healthy competition to a level consonant at least with the workings of trade secret law under optimum conditions.⁵¹⁷ With such a mechanism in place, innovators will feel confident enough to invest because they know that borrowers will pay adequately for the innovation they use rather than resorting to free-riding tactics. At the same time, borrowing members of the innovative community will understand that members capable of innovating at any given time remain more willing to make the necessary investments than would be true in the presence of unrestricted free-riding. Hence, borrowers should fare better under this regime, notwithstanding their obligation to contribute to the overall costs of innovation, than they would under a regime that allowed free-riding.

Innovative communities subject to market failure under classical trade secret law thus stand to gain from standardized, collective agreements that compensate for that market failure without depriving individual actors of the freedom of choice that enables trade secret regimes to yield pro-competitive results under optimum conditions. Besides restoring the bases for market-driven decisions to invest in incremental innovation, such agreements could also become market-enhancing in the sense that they positively influence the direction of innovation toward improvements, new applications, and extensions, in keeping with the loosely codified trade secret model they replace. An off-the-rack set of liability rules that promotes the public interest and that provides a menu of options

516. See Friedrich Schneider & Werner W. Pommerehne, *Free Riding and Collective Action: An Experiment in Public Microeconomics*, 96 Q.J. Econ. 689, 689 (1981) (downplaying effect of free-rider problem in this context); see also Gunnar Karnell, *Extended Collective License Clauses and Agreements in Nordic Copyright Law*, 10 Colum.-VLA J.L. & Arts 73 (1985) (showing how one group of countries approached this problem in regard to blanket licensing in copyright law).

517. See, e.g., Robert D. Tollison, *Public Choice and Legislation*, 74 Va. L. Rev. 339, 342 (1988). In the model suggested here, both innovators and borrowers constitute an interest group, or the "public" that will collectively choose the values best-suited to govern its negotiational needs. See also Jonathan R. Macey, *Public Choice: The Theory of the Firm and the Theory of Market Exchange*, 74 Cornell L. Rev. 43 (1988); cf. Patrick Bolton & Joseph Farrell, *Decentralization, Duplication, and Delay*, 98 J. Pol. Econ. 803 (1990) (discussing situations where centralized organization is best suited to attract new markets and when free competition better serves this purpose). For a model of this kind to succeed, its very existence may require adjustment of the antitrust laws. See, e.g., *Fashion Originators' Guild of America v. FTC*, 312 U.S. 457, 463 (1941). At the same time, baseline rules approved by Congress must ensure that group decisions only fall within a range deemed to be consistent with the public interest. See *infra* text accompanying notes 555-560.

deemed desirable by the community of innovators as a whole would thus replace the myriad single transactions that courts and administrators are currently supposed to vet. To be sure, innovators in a position to invoke the protection of classical trade secret law need not forego that option in favor of the substitute regime if they chose not to do so. Parties could also contract around the community's default rules so long as they remained willing to forego immunity from public scrutiny of any anticompetitive effects likely to result from the imposition of nonstandard conditions.⁵¹⁸ To the extent that two-party licensing agreements provided, say, for longer lead-time periods of immunity from reverse engineering or for harsher licensing conditions than under the standard deal, the authorities would remain free to test the compatibility of these conditions against the public interest in free competition, as occurs at present.

To the extent that innovators seek protection from patent, copyright, and trademark laws, they must continue to satisfy the requirements of eligibility applicable to each of these regimes. To the extent that innovators fail to qualify for protection under these regimes or regard the level of protection available from them as inadequate, they can invoke the off-the-rack liability regime whose terms and conditions satisfy both the needs of the innovative community and those of the public. In this way, for example, unpatented industrial designs, unpatentable products of biogenetic engineering processes, and the functionally determined, noncopyrightable components of computer programs could all find a temporary refuge in a market-driven set of default liability rules before enduring the rigors of totally free competition. Successful implementation of this regime in the domestic laws of the technology exporting countries would then lead swiftly to its incorporation into the evolving TRIPs Agreement at the international level, as has already occurred in a few short years with recently devised hybrid regimes of exclusive property rights.⁵¹⁹

518. In practice, parties would probably enter private contracts on better than baseline rates as a matter of course, rather than risk having the baseline rules invoked against them in the future. There is some evidence for this in the music industry practices associated with the compulsory mechanical license for phonorecords. See 17 U.S.C. § 115 (1988); Sidney Shemel & M. William Krasilovsky, *This Business of Music* 242-43 (6th ed. 1990) (discussing Harry Fox licenses).

519. See, e.g., GATT/TRIPs, *supra* note 7, art. 35 (mandating protection of integrated circuit designs); *id.* art. 27(3)(b) (mandating protection of plant varieties as fallback option in certain circumstances); see also Reichman, *TRIPs Component*, *supra* note 7, at 258-63 (evolutionary pressures under TRIPs institutional framework and dispute-resolution machinery). The notion that international law impedes rapid harmonization of new intellectual property regimes, given sufficient consensus among the most severely affected countries, was always a red-herring, as Professor Soltysinski pointed out. See Stanislaw J. Soltysinski, *Legal Protection for Computer Programs, Public Access to Information, and Freedom of Competitive Research and Development Activities*, 16 *Rutgers Computer & Technology L.J.* 447, 448-49, 455-70 (1990). After the GATT/TRIPs Agreement which, for example, internationalizes trade secret protection for the first time, the argument is preposterous, if only because the affected countries can always pay for the

In short, the best way to cure the market failure resulting from a breakdown of classical trade secret law is to construct a substitute liability regime that rationalizes the functions that trade secret law performed under optimum conditions. A regime that behaved like trade secret law even with respect to know-how applied to products sold on the open market would, in effect, institute a regime of "portable trade secrets" subject to a community-wide set of default rules. Such a regime would adopt the minimalist goals of restoring healthy competition by correcting market failure and by allocating contributions to overall costs of research and development to the community of innovators and borrowers as a whole without distorting the individual, market-driven decisions of innovators to innovate and of borrowers to borrow. Rather than multiplying barriers to entry that discouraged investment over time and that distorted both the pace and direction of innovation in the long run, such a regime would seek to balance the interests of originators and borrowers in such a manner that the community of innovators as a whole was ultimately better off no matter which entries from a prefabricated menu of investment strategies either side elected to employ.

b. *The Fair Follower's Menu of Pro-Competitive Legal Options.* — In addition to providing innovators with a minimum period of artificial lead time in which to recoup their investments, an off-the-rack liability regime to protect applied know-how should provide borrowers with a menu of options for allocating contributions to the costs of research and development according to the more or less market-enhancing uses to which the borrowed innovation may be put.⁵²⁰ In an ideal world, if borrowers agreed to compensate originators for the true costs of their borrowing under all circumstances, and if transaction costs were otherwise negligible, then borrowers could conceivably obtain almost total freedom to follow their market instincts. In the face of real world transaction costs, including formidable difficulties of defining and tracking the social costs of borrowing, a more modest but workable set of goals seems in order. One such goal is to avoid impeding uses that may prove very socially productive under the right set of circumstances. Another is to adjust compensation for the costs of borrowing to reflect the harms that originators suffer from different kinds of unauthorized uses of their know-how, and the benefits to the public and to the community of innovators from decisions about different uses of this know-how.

Based on the trade secret literature, it seems safe to posit that both the public interest and that of the community of innovators are well

desired level of intellectual property protection by granting offsetting trade concessions of their own. See Reichman, TRIPS Component, *supra* note 7, at 255–58 ("compensation as the New Master Principle").

520. See *supra* text accompanying notes 470–471, 487–488, 508–509. For a brilliant application of the menu approach to default rules in the context of bankruptcy law, see Robert Rasmussen, *Debtor's Choice: A Menu Approach to Corporate Bankruptcy*, 71 Tex. L. Rev. 51 (1992).

served when fair followers develop substantial improvements or new applications of existing technology.⁵²¹ If so, both the period of artificial lead time allotted under the default rules and the amount of obligatory contributions to overall research and development should logically shrink in the presence of these uses. By contrast, second comers who opt to compete in the same market segment with products exactly imitating those of an innovator operating under the standard default rules should have to overcome the longest waiting periods (in the form of artificial lead time). They should also pay the largest contributions to the overall costs of research and development envisioned by the scheme. Although these competitors benefit consumers through price competition, they do not advance the innovative community's technical expertise and should not sap its prior expertise before innovators themselves can begin to recoup their investment.

In principle, while borrowers will prefer shorter lead times and lower user fees payable over the shortest possible times, and innovators will want a schedule that does quite the opposite, the public interest in free competition at the earliest convenient time trumps both preferences. In practice, however, the moment that today's borrower converts yesterday's innovation into an improvement or new application, that borrower *qua* innovator will prefer longer lead times and a more remunerative schedule of compensatory user fees. By establishing an appropriate range of lead times and user fees that takes account of both interests, the system can generate and distribute contributions to research and development for all successful members of the innovative community. Moreover, these contributions should mount with the overall success of the community's technical projects, which means that successful subcommunities of innovators would find themselves managing progressively larger investment funds over time.

A legal framework devised to implement these decisions provides all prospective borrowers with a set of legal and business options that will necessarily enter into their own cost-benefit analyses. Suppose, for example, that a hypothetical default regime were to provide a maximum blocking period of four years, during which time competitors could not enter the same market with substantially the same unpatented product absent an agreement with innovators.⁵²² The position of single borrowers will then vary with the status of their own research and development at the times they must select from the menu of other permissible legal and busi-

521. See, e.g., Friedman et al., *supra* note 14, at 67, 69.

522. The example is purely hypothetical and not a recommendation of a four-year term. In principle, given the minimalist aims of this know-how regime, the maximum period available for any form of relief should be very short. Periods of two to three years of lead time have particular appeal. Cf. *supra* text accompanying text note 215; *supra* note 206 and accompanying text (two-year lead-time period for unregistered designs in EC proposed reform). Such a system requires a new class of protectible objects (identified as the industrial compilation) and new approaches to tracking the relevant transactions.

ness strategies. Would-be borrower B, who had already invested considerable funds in research and development relevant to products like that of innovator A, may not want to borrow at all when competing with that innovator. In order to overcome the blocking period devised to slow the entry of parasitic competitor C, who competes with essentially the same product obtained by essentially the same means, competitor B will logically consider entering the market with a product that improves on that of innovator A.

In evaluating this strategy, competitor B will take into account any shorter blocking period to which he may be entitled as a competitor who enters the same market with substantial improvements. Suppose, for example, that the hypothetical model allowed competitors making substantial improvements in any given innovative product to enter that same market after only a one-year blocking period instead of the four-year period applicable to wholesale imitators.⁵²³ Competitor B's own pre-existing investment in research and development presumably facilitates his taking this option. Nevertheless, competitor B must also evaluate the costs and benefits of other available options, including those pertaining to the schedule of fees for unauthorized borrowing within predetermined periods of time. This calculus enables him to decide whether he should develop the desired improvements independently and without appropriating A's contribution or borrow certain components of proven commercial success from innovator A, in which case he will incorporate them into his own product after defraying payments of the scheduled user's liabilities to A. Competitor B must also consider the possibility that a negotiated license from A covering use of the desired components might cost less than the relevant user fees under the schedule set by the default rules.⁵²⁴

Suppose, for example, that the hypothetical model conditioned unauthorized borrowing for purposes of improvement on the payment of

523. Again, the period is merely illustrative, although substantial improvers should never be subject to a blocking period greater than one or two years at the most, and there is a good case for allowing improvers to enter freely, with no blocking period. Also, a more complex option could distinguish between nonborrowing and borrowing improvers, subjecting the latter to a blocking period of, say, two years, in addition to a user's fee. However, refinements like these add to transaction costs, which the simpler models greatly reduce.

524. Cf. Shemel & Krasilovsky, *supra* note 518 (Harry Fox licenses). Innovators sensing some objective difficulties in the competitor's task of reverse engineering under the schedule of user fees might try to charge more to share their knowledge directly. This is in the spirit of the game, which encourages individuals to make the most of what they think they have, within the parameters set by the default rules. However, familiarity with the system over time, and repeated interactions between players would probably lead to blanket licensing practices that reduce the likelihood of negotiations in single cases.

reasonable royalties for a three- or four-year period.⁵²⁵ So long as the second comer was prepared to make substantial improvements during this period, the hypothetical model provides him with at least the following options: (1) enter the market quickly with his own product and its autonomously developed improvements; (2) enter quickly with his own product and with improved components borrowed from other innovators at scheduled rates; (3) enter quickly with his own product and with improved components licensed from other innovators; or (4) delay entry beyond the specified period of liability and borrow unpatented, noncopyrightable components at will and without payment. If the third option becomes feasible owing to an innovator's willingness to enter a licensing agreement, it could be desirable if it costs the borrower less to purchase the needed know-how than to reverse engineer it under the schedule of permitted uses and fees. In all cases, the fair follower's cost-benefit analysis must take into account the differentiated liabilities, if any, attaching to different strategies of use under the standard default regime, in addition to his own autonomous costs of research and development.

A more complex model would extend the menu of options to borrowers who competed in distant market segments, but who nonetheless adapted significant features or components borrowed from innovators for purposes of these new applications. Assume, for example, that the hypothetical model imposed no blocking period upon would-be competitor D, who proposed to compete on a market segment distant from that of innovator A. Competitor D intends to adapt certain features of innovator A's product for use in an entirely different product on this distant market segment. However, the interest of the relevant technical community may best be served if borrower D contributes, according to a schedule of user's fees, to innovator A's costs of research and development when he proceeds to do so within a specified period of time, say, four years from the date of public distribution. The reason is that borrower D's interest in extending innovator A's contribution to new applications on distant markets within a relatively short period of time demonstrates that A's innovative skills are of value to the relevant technical community, irrespective of the success of innovator A's product on its own market segment.

Competitor D's payment of a reasonable royalty for this purpose would thus help to preserve innovator A's firm for future technical achievements. It also ensures that competitor D's own product, sold on a distant market segment, had not been underpriced due to hidden appropriation of innovator A's investment in research and development. However, competitor D labors under no obligation to make any payment if he develops his own product without too quickly borrowing components of

525. The length of this period would depend, in part, on whether there was also an absolute blocking period to overcome or not. In principle, the longer the blocking period, the shorter the period of user liability should be and vice versa.

A's product for purposes of extension and new applications. The menu of options available to competitor D thus allows him at least the following choices: (1) forego using features like those in question altogether; (2) develop analogous features for the new application by means that do not appropriate the relevant components of A's product; (3) borrow the features from innovator A at scheduled rates; (4) license the features directly from innovator A; or (5) wait until the liability period lapses and then borrow innovator A's unpatented, noncopyrightable features without payment. In all cases, the final decision depends on each firm's own estimate of costs and benefits, while similarly situated firms might rationally take different decisions on the same set of facts.

In principle, a second comer wishing simply to compete on the same market segment with a substantially identical product should expect to delay entry for the longest period of artificial lead time and to pay the highest user fees after entry. In contrast, a second comer who enters the market with a substantially different product should expect to pay less—perhaps, indeed, nothing at all—and to delay his entry for the shortest amount of time—perhaps, indeed, not at all under the appropriate circumstances. Between these extremes, other options merit consideration as suggested above, and some of these options are further explored in the *Manifesto*,⁵²⁶ with particular reference to electronic information tools.

For present purposes it suffices to emphasize that under a default liability regime that standardized the user's rights to borrow unpatented know-how, a fair follower's decision for or against borrowing an originator's contribution, whether by reverse engineering or other means, turns in part on the state of his or her own technical capabilities, and in part on an estimate of which market strategies will prove most profitable once the system-wide liabilities are acknowledged. Any decision to borrow by whatever means, including reverse engineering, may or may not result in improvements or new applications depending on the second comer's technical abilities and on his judgments concerning market potential. Yet, so long as the schedules are optimally drawn to begin with and their differentiated liabilities figure into each entrepreneur's calculus of his or her own opportunities, both the public and the community of innovators as a whole should stand to benefit from the different options inscribed on the menu that the system ultimately provides. Indeed, *so long as the appropriate dues are paid in each case*, the legal system remains indifferent to whether the second comer steers clear of the originator's product or borrows substantial components of that product to facilitate entry and attract the same set of consumers within the applicable periods of time.

An off-the-rack liability regime seeking to compensate for the breakdown of classical trade secret law would thus substitute a menu of liability options that are intrinsically pro-competitive for the socially unproductive options that arise either from excessive free-riding or from the institution

526. *Manifesto*, supra note 61.

of exclusive property rights. Rather than reducing the number of options available to competitors for the sake of administrative convenience and imposing a priori criteria for their exercise that have nothing to do with market-determined values, the standard deal should propose a menu of options each of which is always potentially of social value when implemented in successful market strategies. What ultimately drives the system, in other words, are the autonomous investment decisions of single innovators and borrowers, decisions that result from the individual entrepreneur's own assessment of the risks involved and the relative costs and benefits likely to ensue from any given strategy.

3. *In Search of a Community-Wide Know-How Transaction.* — In order to solve the puzzle that applied scientific know-how poses for the world's intellectual property system, this study posits that innovators and borrowers must negotiate a set of default liability rules in the place of yet another makeweight regime of exclusive property rights imposed from on high. The liability regime in question must perform all of the pro-competitive functions that classical trade secret law provides under optimum conditions notwithstanding the inability of innovators to preserve actual secrecy with respect to the objects of legal protection. Such a regime must also keep transaction costs to a minimum, avoid external interference with the autonomous, market-driven decisions of single investors, and satisfy the public-interest guidelines that legislators formulate in the course of structuring a codified regulatory scheme. Because investors in incremental innovation are as likely to be borrowers as originators over time, without knowing in advance which status will most advance their strategic interests in the end, a community-wide default transaction stands a good chance of attaining optimal results for all concerned.⁵²⁷

This study has further demonstrated that trade secret law logically breaks down into three functional components: lead time, users' rights, and rules of the competitive game.⁵²⁸ It follows that innovators and borrowers can organize a liability regime that emulates the functions of trade secret law with the least disruption to free competition by providing those

527. Default rules have their limits, however, which must be taken into account. See, e.g., Jay M. Feinman, *Relational Contract and Default Rules*, 3 S. Cal. Interdisciplinary L.J. 43, 46, 49-51 (1993) (contending that implementation of default rules approach suffers from the same inadequacies as prisoner's dilemma model, namely, that both assume parties are facing similar situations and will act rationally in their self-interest). The fact remains, that, however, trade secret law is already an imperfect set of default rules on which competition depends. Rationalizing those rules can only lead to pro-competitive results that are better and that entail no greater social costs than those currently in place. That is the sense in which the proposed default rules are minimalist but more pro-competitive with respect to applied know-how than either totally unrestrained competition or hybrid grants of exclusive property rights.

528. See *supra* text accompanying notes 470-488. The existing legal hybrids, despite their misplaced reliance on exclusive property rights for the most part, often teach valuable lessons about these functions when analyzed from the perspective of liability regimes.

who invest in industrial applications of advanced technical know-how with artificial lead time to overcome market failure, with a menu of users' fees that sensibly allocates contributions to the costs of research and development among members of the relevant technical community, and with a common set of pro-competitive ground rules that also make it possible for the relevant technical communities to take collective action to enforce and adjust the liability framework ultimately adopted.

A three-year study of these functions in the context of formulating a model regulatory framework for computer software confirms that an optimal liability regime would consist of at least six structural elements.⁵²⁹ These include the following: (1) treating industrial compilations as the proper object of protection; (2) providing artificial lead time; (3) developing a menu of users' liabilities; (4) allowing registration with minimal disclosure; (5) supplying legal and technical ground rules to preserve and enhance competition; and (6) developing appropriate bases for collective action.

a. *The Industrial Compilation.* — Trade secret law normally protects new applications of know-how and skilled efforts to industry that are selected and arranged so as to obtain either a product that behaves in a particular way or a process for obtaining such products. Case law and commentary sometimes characterize this phenomenon as a "compilation" in the sense that the results of pre-existing skills and techniques are mixed or combined with the results of newer skills and techniques to achieve a novel (but less than nonobvious) solution to a particular engineering problem.⁵³⁰ It is these unique compilations of applied know-how that complainants must descriptively represent when lodging actions for the misappropriation of trade secrets.⁵³¹ By transposing this concept of an industrial compilation to a default liability regime, it becomes feasible to identify and track the discrete bodies of know-how whose different uses will trigger different liabilities under the model ultimately adopted.

This capacity of know-how to be conveyed, represented, and transmitted, already emphasized by Professor Magnin in 1974, gives it properties that resemble those of literary works.⁵³² Innovators may, indeed, protect selections and arrangements of information as copyrightable compilations to the extent they contain original and creative expres-

529. See generally Manifesto, *supra* note 61, at 2412.

530. See *supra* note 13 (quoting Restatement of Torts).

531. The difficulty of doing this should not be underestimated. See, e.g., Reichman, *Overlapping Proprietary Rights*, *supra* note 74, at 100-04 (difficulty of determining what knowledge employee may take with him to another job). Nevertheless, the industrial compilation already has a rudimentary existence, and its refinement is crucial to the regime proposed here.

532. See Magnin, *supra* note 22, at 115-16; Troller, *supra* note 22, at 1511; see also *supra* note 22 and accompanying text (defining know-how).

sion.⁵³³ In traditional copyright law, however, protection extends only to the expression or explanation of technical ideas and functional results, not to the ideas and results themselves.⁵³⁴ This distinction, in turn, becomes obsolete in a post-digital age of electronic information tools, as the *Manifesto* shows, because functionally determined selections and arrangements of information now actually yield the functional behavior they also happen to express.⁵³⁵ It is precisely this functionality that distinguishes an industrial compilation from a copyrightable compilation.⁵³⁶

Industrial compilations are the proper objects of an off-the-rack liability regime, in the sense that this regime enables successful investors to appropriate some of the market-determined values accruing from the embodiment of particular selections and arrangements of know-how in products sold on the open market. The concept of the industrial compilation thus stands for a novel selection and arrangement of functional features that produces an innovative utilitarian result. What innovators claim when they seek the minimalist protection available from a default liability regime are new industrial compilations and subcompilations that produce particular functional behavior by a particular combination of parts. They cannot claim either the abstract idea or the discrete units of information that are selected and arranged within particular industrial compilations, except insofar as these rise to the level of a novel subcompilation. Moreover, the same functional behavior may result from two or more compilations or subcompilations, whose internal combinations of constituent elements differ significantly. In such a case, the default regime provides no basis for the originator of either industrial compilation to impose liability on the other because neither is substantially identical to the other.⁵³⁷

This concept, like other structural aspects of the proposed regime, requires further elaboration and refinement. It suffices to note here that the components of an industrial compilation may be new or old and may consist of any combination of form or function, whether that partakes of design, skilled efforts, or information. In principle, the novel selection

533. See, e.g., 17 U.S.C. §§ 101, 102(a), 103 (1988 & Supp. 1994) (definition of compilation).

534. See, e.g., 17 U.S.C. § 102(b), 103 (1988).

535. See *Manifesto*, supra note 61, at 2316–17.

536. A literary compilation intended for use might qualify as either a copyrightable compilation or an industrial compilation in certain circumstances. See supra note 532. This presents no problem because the owner of copyright in expressive elements of the compilation has no interest in the minimalist liability regime, while the proprietor of the industrial compilation cannot protect any functional behavior in copyright law. See *Baker v. Selden*, 101 U.S. 99 (1879); supra notes 285–289 and accompanying text. Fears that tensions will result from overlapping regimes, as occurs with exclusive property rights, stem largely from a misreading of the minimalist nature of the default liability regime, and a failure to perceive the complementary interaction between patent, copyright, and trade secret laws in the past. See, e.g., *Stedman*, supra note 13, at 24–25.

537. See *Manifesto*, supra note 61, at 2395.

and arrangement of new or old elements that produces the innovative result reflects the innovator's know-how. When that know-how becomes embodied in an industrial product, the result is an industrial compilation of know-how applied to industry.⁵³⁸

b. *Artificial Lead Time.* — As previously demonstrated, the provision of natural lead time through the obligation to reverse engineer undisclosed know-how by proper means is one of the three basic functions of classical trade secret law.⁵³⁹ It is also the one function of that law that drafters of the legal hybrids have most often emulated, in the sense that existing regimes usually provide artificial lead time to overcome market failure in one form or another. A default liability regime devised to protect unpatented, incremental innovation should logically provide a short term of artificial lead time to guarantee investors that free-riders will not immediately duplicate know-how applied to publicly distributed products.

The duration of a lead-time provision that blocks would-be competitors from marketing a particular industrial compilation may vary with the needs of the technical community concerned, with the extent to which a second comer's innovation differed significantly from that of an originator (as should typically occur in the case of improvements and adaptations), and with the distance separating the second comer's market segment from that of an originator (as would become relevant when an innovative complication or subcompilation was extended to quite different applications). In the interest of overcoming market failure by reciprocal agreement, however, the relevant innovative communities must adhere to one overarching goal, which is to achieve more—not less—competition. It follows that, in the process of providing artificial lead time, a default liability regime should err on the side of shortness. Even then, second comers may further shorten or override these stipulated periods of artificial lead time by resorting to certain privileged uses in exchange for the users' fees discussed below.

Shortness of duration, in turn, discourages strategic responses to avoid both lead-time barriers and users' fees. It also obviates the need for subtle and complex legal machinery to repress these responses.⁵⁴⁰ In this

538. Control over the tangible vehicle of communication tends to provide effective control over the know-how it embodies, despite the otherwise intangible and potentially ubiquitous character of the know-how in its disembodied state. See, e.g., Troller, *supra* note 22, at 151, who wrote "know-how, as an intangible thing, . . . is fixed on a tangible thing . . . by physical means. . . . In this way, know-how is detached from the awareness of the individual . . . and made an item of independent information comprehensible to third persons." *Id.*; see also Manifesto, *supra* note 61, at 2330–31. The parallel between "art applied to industry" (i.e., applied art) and "know-how applied to industry" (i.e., industrial compilations of applied know-how) is deliberate. See *supra* text accompanying notes 270–274.

539. See *supra* text accompanying notes 469–487.

540. Cf. Reichman, *Designs Before 1976*, *supra* note 127, at 1213–16 (discussing virtual absence of invalidation defenses in caselaw under Italian design law prior to 1977, i.e., before the term of protection was extended from four to fifteen years).

connection, the two- and three-year periods of artificial lead time respectively provided by the SCPA of 1984 and the Japanese unfair competition law of 1993 have much to recommend them.⁵⁴¹

c. *A Menu of Users' Liabilities.* — Classical trade secret law blocks entry to competitors who do not reverse engineer unpatented innovation by proper means, and it also allocates contributions to the collective costs of research and development either indirectly, through the costs of reverse engineering itself, or directly in the form of royalties paid by licensees. A default liability regime, besides blocking entry to wholesale copiers for a very short period of time, should logically allocate contributions to the costs of research and development among borrowers of applied know-how for a limited period of time. The relevant technical community, operating within guidelines that safeguard the public interest, should accordingly establish a market-enhancing schedule of automatic license fees for this purpose.⁵⁴²

Because single members of the technical communities developing incremental innovation can rarely know in advance when their future interests will lie in playing the role of innovator or that of borrower, they should find common ground for establishing a reciprocally acceptable period of time during which contributions for specified uses should accrue. Given the pro-competitive goals of an off-the-rack liability regime and the unpredictable roles that individual investors will play at any given time, most of the players should agree, in principle, to keep the periods of liability short in the absolute sense. They should also agree to keep involuntary contributions to research and development during the specified periods affordable for most members of the technical community as a whole, regardless of the roles that specific members currently play. To the same end, the relevant legislative framework must ensure that neither the periods in which user fees become due nor the calculus of those fees, as determined by the relevant technical communities, exceed outer limits reflecting the public interest in free competition.

Keeping the periods of automatic licensing short limits the share of collective costs that fast-moving borrowers of successful innovation must pay to those responsible for benefits conferred, while avoiding free-riding uses that penalize successful innovators. It also frees up more unpatented innovation for free competition with the passage of time, as occurs naturally under trade secret laws. Still another, more subtle reason for keeping the periods of automatic liability short in the absolute sense is that it obviates the need for complicated gatekeeping criteria to distinguish taxable from nontaxable innovation.

Suppose, for example, that the period of automatic licensing lasted only three to five years. So long as the test for infringement of a particu-

541. See SCPA, *supra* note 205, at §§ 904, 908(a) (1988); Swiss and Japanese unfair competition laws, *supra* notes 209, 213.

542. See *supra* text accompanying notes 470–474, 485–488.

lar industrial compilation is cast in terms of "substantially identical" versus "substantially different" criteria,⁵⁴³ there is no need for an additional subtest to measure actual improvements. Instead, allowing a presumption of improvement from a showing of substantial difference, although not always empirically accurate,⁵⁴⁴ greatly reduces transaction costs and appears consistent with a very short term of duration. Similarly, it becomes unnecessary to determine if a second comer's innovation was "dependently" or "independently" created, except during the blocking periods that restrain wholesale copiers of a protected industrial compilation. During the period in which second comers remain liable for user fees if they borrow registered compilations or subcompilations, only the substantial identity test and not independent creation really matters.⁵⁴⁵ If the second industrial compilation or subcompilation at issue differs significantly from the first, no liability attaches. Conversely, if the second comer's product performs essentially the same functional behavior by essentially the same industrial compilation or by substantially identical components thereof, it should remain subject to scheduled user fees for the specified period of time.

A menu of differentiated user fees also permits the technical community to ensure that its off-the-rack liability regime moves incremental innovation in the direction of improvements and new applications, as occurs naturally under classical trade secret law. As previously demonstrated, for example, both the period of time in which user fees become due (and, if desired, the calculus of those fees) may logically vary with both the nature of the use and the market segment on which the use occurs.⁵⁴⁶ Third parties who compete against innovators on the same market segment with essentially the same industrial compilation or important components thereof should expect to encounter the longest blocking periods and to pay the highest user fees for the longest period of time. In contrast, third parties who elect to compete on the same mar-

543. This is the test of infringement developed under the SCPA. See Manifesto, *supra* note 61, at 2400; *supra* notes 239-242 and accompanying text.

544. See *supra* notes 240-241 and accompanying text.

545. That is, the barrier to entry for literal copying, if any, is broken by a showing of independent creation, but liability for borrowing that leads to improvement is not affected by a showing of independent creation without a showing of substantial difference. Such liability would normally attach to the unlicensed use of selected components or subcompilations to produce a whole that differs from that of an originator. See, e.g., Manifesto, *supra* note 61, at § 7.3.

546. See *supra* text accompanying notes 521-524. In principle, transaction costs are lower if a single calculus is used, as occurs successfully under the Italian liability regime that protects engineering projects. See *supra* text accompanying notes 226. However, to the extent that a more complex model envisions blanket licensing administered by an agency for collective action, see *infra* text accompanying notes 559-560, a differentiated calculus of fees becomes feasible. Cf. Zentaro Kitagawa, *Copymart: A New Concept—An Application of Digital Technology to the Collective Management of Copyright*, in *WIPO Worldwide Symposium on the Impact of Digital Technology on Copyright and Neighboring Rights* 139, 142-46 (W.I.P.O. ed., 1993).

ket segment with substantially different products that nonetheless borrow from or replicate components of an originator's industrial compilation, as might occur in the case of improvements and new applications, should logically pay the same or lower user fees for a shorter period of time. Improvements and new applications of this kind would thus earn fair followers a bonus by shortening or eliminating the period of artificial lead time that would otherwise delay their entry into the market. By the same token, fair followers who opt to compete on distant market segments with different products that nonetheless apply major features borrowed from an originator's industrial compilation to new uses should expect to pay user fees for the shortest period of time, and would altogether be immunized from the blocking effects of any lead-time barrier to entry.⁵⁴⁷

A schedule of users' liabilities that innovators and borrowers would approve thus provides both sides with a self-executing menu of investment options that are functional equivalents of those available from trade secret law under optimum conditions and that are pro-competitive to boot. The primary bases for any given second comer's investment strategy continue to include such factors as the relative state of his or her own research at the time of making a strategic response to new market challenges, the costs and benefits of developing either functionally similar or improved products by relatively independent or dependent modes of engineering, and the relative likelihood that one strategy or another will yield the most profitable response from consumers at the lowest cost. While the schedule of users' fees and lead-time periods necessarily figures into these investment decisions under an off-the-rack liability regime, these factors merely represent quantified functional equivalents of similar factors that fair followers normally take into account when classical trade secret law performs its traditional role. In either case, second comers remain free to adopt the strategies that appear most consistent with their own research capabilities and with their own estimates of market prospects.

In recreating the premises for healthy competition under post-industrial conditions, a default liability regime avoids backing either innovators or borrowers into the kind of prefabricated, externally imposed choices typical of exclusive rights regimes—choices which tend to produce inefficient results outside a narrow band of ideal circumstances.⁵⁴⁸ In a broader perspective, once a schedule of user fees and options that the technical community as a whole would approve becomes embodied in an off-the-rack liability regime, the success of any given innovation on the

547. See *supra* text accompanying notes 523–526.

548. In contrast, the hybrid exclusive rights regimes sometimes do recognize a form of users' rights, but they have a penchant for ignoring corresponding liabilities. For example, the second comer's right to reverse engineer en route to the production of independently created chip designs under the SCPA yields a most valuable user's right, but it carries zero liability in terms of contributing to the originator's own costs of research and development. See *supra* notes 240–244 and accompanying text.

products market within the allotted periods of time should redound to the benefit of the community as a whole. This conclusion follows, regardless of the respective shares taken by single innovators and borrowers, because both parties are more likely to return to the market with future innovation when innovators generally receive revenues from the successes of borrowers and borrowers generally achieve successful innovation by sharing the costs of innovation. This contrasts with present conditions under which innovators tend to take too much, borrowers tend to pay too little, and the progressive impoverishment of the community as a whole—especially its smaller firms—undermines its technical capabilities for the future. Instead, when borrowers agree to pay innovators a fair contribution to the costs of research and development, the community as a whole gains investment resources that expand its aggregate technical capabilities.

Because members of the technical community participate alternately as both innovators and borrowers, the community will achieve the greatest progress when all the valid participants in its market successes share in the returns from a *de facto* community-wide innovative enterprise within the operative period of time. The overall results remain pro-competitive because only the market determines the commercial success of any single investment strategy. Cumulative individual successes enhance the technical community's overall prospects for future innovation by increasing the funds available for investment and by allocating a good part of these funds to producers of the most successful innovation. The technical community as a whole thus enjoys prospects for optimal development of unpatented innovation that no regime of exclusive property rights can provide.

d. *Registration with Minimum Disclosure.* — Classical trade secret law does not formally oblige originators to identify or claim their innovation in the manner of patent law, except when suing third parties for misappropriation or when entering direct licensing agreements with such parties. In practice, however, innovators cannot benefit from trade secret protection at all unless they incur the trouble and expense of fencing off the secret information available on a need-to-know basis from that available to employees and customers generally.⁵⁴⁹ This process of identifying and representing the innovator's industrial compilation becomes crucial when classical trade secret law breaks down and innovators turn to an off-the-rack liability regime for relief. In such a case, innovators intending to collect user fees in addition to any lead-time advantages accruing from the system should logically have to register an identifying description of the industrial compilation in question after a reasonable period of time in which to test the market. In so doing, however, an innovator should not have to disclose more of the underlying know-how responsible for the claimed industrial result than appears sufficient to enable fair followers

549. See *supra* notes 20–21 and accompanying text.

to avoid unintended replication of the same functional behavior by essentially the same industrial compilation.

Like classical trade secret law, in other words, a liability regime for applied know-how should not promote disclosure of incremental technical advances for its own sake, in the manner of patent law and certain other exclusive rights regimes.⁵⁵⁰ Rather, a minimalist liability regime challenges third parties to make the investment necessary to exploit these advances in further innovation of their own, and it provides legal machinery for third parties to contribute, directly or indirectly, to the costs of the innovation they borrow. When the task of reverse engineering any given application of know-how to industry looks hard, the innovator may prefer to remain under classical trade secret law, which can provide him or her with natural lead time and which thrusts the full costs of further research and development onto would-be competitors. Only when the task of reverse engineering looks too easy would innovators turn to an off-the-rack liability regime for compensatory relief. In such a case, the originator must duly register an identifying description of the industrial compilation at issue and of any subcompilations or major components that are to be taxed in the form of user fees.

Applications to register industrial compilations should indicate how given selections and arrangements of applied know-how relate to the functional performance they achieve without disclosing the internal know-how by which the functionality so described is actually accomplished. The description may also indicate how the registered compilation differs from pre-existing compilations, especially when a similar performance or behavior is achieved, without disclosing the means by which this difference is accomplished.⁵⁵¹ The objection is primarily to facilitate application of the automatic licensing mechanism applicable to second comers who exploit the registered matter in the course of developing their own industrial compilations. A secondary objective is to facilitate the mediation of disputes within the framework established for collective action. In either case, the public interest benefits most from the productive uses that second comers make of the originator's innovation by invoking the menu of user options, and not from mandatory disclosure of technical results.

Describing a particular correlation between applied know-how and a certain functional result for registration purposes does not invest a claim-

550. This follows from the minimalist nature of the default liability regime itself, which aims to restore the bases for healthy competition without more. Requiring full disclosure in return for virtual competition constitutes too great a disincentive to make use of the regime. However, if the term of protection is not very short, then disclosure should become mandatory. See *supra* text accompanying note 508.

551. An infringement action would, of course, require full disclosure, as occurs in the case of utility model laws. See *supra* notes 109–113 and accompanying text. An opposition proceeding like that available under the German Utility Model Act also seems worthy of consideration.

ant with any exclusive rights to the know-how itself, to the functionality obtained, or to the relation between the two. Rather, by registering a set of identifying claims an innovator gives second comers notice of potential liability for specified future uses of the industrial compilation or subcompilations so described (or significant components thereof) and allows second comers to adopt the most suitable investment strategies in relation to the menu of user liabilities. Competitors that elect to move into the market by borrowing or replicating registered industrial compilations or major components thereof within the specified periods of time become subject to the menu of user liabilities, as enforced by the technical community's agent for collective action.⁵⁵²

Registration also constitutes notice to the community at large that certain industrial compilations will become subject to user fees for specified periods of time unless potential users convince the community—through its collective agent—not to honor the claim. The most likely ground for objection is that an industrial compilation proposed for registration differs insufficiently from pre-existing industrial compilations already exploited on the market. Claims to this effect are best resolved by mediation under the auspices of an agency responsible for collective action, as discussed below, although formal opposition proceedings could also be made available.⁵⁵³ Over time, a registration system along these lines encourages the relevant technical communities to develop repertoires or banks of industrial compilations, and it permits networked systems of blanket licensing to evolve.

e. *Competition Rules and Technical Standards.* — Classical trade secret law appears to operate with an invisible hand in the sense that single investors make autonomous decisions in relation to their own estimates of the costs and benefits of reverse engineering. In reality, when the burdens of reverse engineering appear so heavy that second comers prefer to pay licensors for the knowledge they need, the licensors become subject to legal regulation in the form of state-imposed, pro-competitive ground rules sounding in the doctrines of misuse and antitrust law. As previously discussed, these modes of trade regulation are clumsy at best.⁵⁵⁴ To the extent they depend on a case-by-case scrutiny of reasonableness, they result in exorbitant transaction costs that eat away at the technical community's overall efficiency and productivity. Nevertheless, a shift to an off-the-rack liability regime makes a set of standardized, pro-competitive ground rules that appeal to both innovators and borrowers even more necessary than before.

To a large extent, the kind of pro-competitive limitations that courts and administrators impose externally under classical trade secret law become automatically internalized under a default liability regime through

552. See *infra* text accompanying notes 559–560.

553. See *supra* note 131, 551.

554. See *supra* note 481 and accompanying text.

adoption of the menu of users' liabilities itself. From this angle, the short periods of artificial lead time, the short periods in which automatic licensing applies, and the availability of options by which second comers may further reduce both these periods and, perhaps, the quantum of user fees that apply constitute the most fundamental, pro-competitive features of the regime. Nevertheless, different technical communities will have different exigencies requiring the presence of additional, tailor-made conditions that both innovators and borrowers would accept. Moreover, the public interest may impose outer limits that conflict with some conditions that the technical community prefers or that require other, more acceptable, conditions in their place; the public interest may also require the relevant technical community simply to operate within certain external constraints or limits.

An off-the-rack liability regime applicable to different technical communities should provide investors with a clear statement of relevant pro-competitive ground rules that either the public authorities or the relevant communities as a whole deem necessary. Besides notions of misuse and procedural matters of general applicability,⁵⁵⁵ ground rules occasioned by the peculiar properties of the technical disciplines in question fit here. Examples might include the "must fit, must match" exceptions of interest to industrial designers, special provisions for algorithms of interest to computer programs,⁵⁵⁶ and rules governing deposits of living matter in connection with the registration of unpatented biogenetic innovation.⁵⁵⁷ Such differences can give a generic liability regime the flexibility it needs to accommodate innovative communities working in very different mediums of technical development.

Still other ground rules may become necessary to mediate the interests of innovators and borrowers when a particular industrial compilation or component thereof happens to become a technical standard for the community as a whole. As standardization progresses and technical systems that solve particular problems give rise to newer, more complex systems built around earlier standardized solutions, the relations between innovators and borrowers will become strained if each side demands preferential treatment at the expense of the other. Prefabricated ground rules should thus ensure that borrowers who need to exploit standard solutions do not too quickly escape liability to innovators who were good enough to devise solutions destined to become standard. On the contrary, default liability rules should permit the standard-setter to collect user fees from all who apply the standard for a relatively short period of time, while encouraging all members of the technical community—

555. See, e.g., *supra* note 18 and accompanying text. By allowing licensors whose agreements satisfy the block exemptions to proceed without further administrative vetting, the European Union already applies a set of standard rules to some know-how transactions.

556. See, e.g., *Manifesto*, *supra* note 61, at 2383–86.

557. See generally Straus & Moufang, *supra* note 188.

whether innovators or borrowers at the time—to use the standard in return for a reasonable royalty for the period in question. Experience with parallel mechanisms under copyright law suggest that the standard-setter's ultimate returns, should he or she have opted to register what later became a standard as an industrial compilation under an off-the-rack liability regime, may sometimes exceed the returns that would have accrued if the innovation in question had been covered by an exclusive property right.⁵⁵⁸

As discussed below, the different technical communities can best formulate and monitor their off-the-rack ground rules by designating agencies through which innovators and borrowers take collective action. However, neither resort to collective action nor a community-wide set of ground rules should altogether displace the individual member's right to contract around these and other rules so long as he or she respects the public interest in free competition. It follows that licensors and licensees who contract around the standard rules of an off-the-rack liability regime should not enjoy the *prima facie* immunity from competition law to which those operating within that regime are always entitled.

f. *Collective Action.* — Because the technical communities' long-term interests are dynamic rather than static, they cannot afford to leave all the regulations they need adopted, or even all the legal machinery they need to implement an off-the-rack liability regime, to the distracted supervision of legislators and administrative agencies. Rather, the task of maintaining optimal relations between innovators and borrowers over time, in the absence of effective trade secret protection, will require the different technical communities operating under an off-the-rack liability regime to establish agencies of their own that are empowered to take collective action on behalf of innovators and borrowers alike.⁵⁵⁹

These agencies, must, in effect, internalize certain functions that legislators and administrators have traditionally carried out under exclusive rights regimes. For example, agencies for collective action must track the uses that are made of registered innovation, collect and distribute user fees, investigate fraud, discipline members who violate the rules, and mediate disputes. Licensing, though automatic and simple in form, also requires such agencies to monitor and periodically adjust the schedule of user liabilities in conformity with the changing needs of the technical

558. Cf. 17 U.S.C. § 115 (1988) (compulsory license for mechanical recordings). In practice, while a songwriter may believe that an exclusive recording by a particular artist would yield the largest returns, experience demonstrates that unauthorized recordings under the compulsory license (or the "voluntary" Harry Fox licenses that result from it) sometimes yield unexpected bonanzas in the end. See, e.g., Shemel & Krasilovsky, *supra* note 518.

559. See *supra* note 511 and accompanying text.

community over time and with the evolution of the public interest itself.⁵⁶⁰

In the early stages of new technical disciplines, the collection of user fees seems fairly easy to organize. As standardization progresses, however, the potential returns to innovators and costs to borrowers from networked applications of particularly successful embodiments of know-how become so great that special rules and procedures are needed. The evolution of technical repertoires also makes blanket licensing a logical development. This, in turn, increases the importance of the agencies responsible for collective action, which would presumably administer both the technical repertoires in question and any system of blanket licensing.

Collective action thus constitutes an integral part of a default liability regime to protect applied scientific know-how, and it is a subject that requires more attention than space permits here. Two observations seem especially pertinent. First, an agency responsible for collective action that combines automatic licensing of an unlimited number of borrowers with relatively frictionless collection of the pertinent user fees will reduce pressures tending to increase transaction costs over time. This follows because customized licensing agreements are seldom needed, user fees are pre-determined and periodically adjusted, and both innovators and borrowers know in advance what can be borrowed, when it can be borrowed, and on which terms and conditions.

Second, familiarity with different types of collection societies under the domestic copyright laws makes it feasible to envision the development of similar agencies in conjunction with a default liability regime for applied know-how. While the operating methods of such future agencies cannot be described in detail, the uncertainty this breeds with respect to both innovators and borrowers makes it possible to conceive of optimal arrangements for collective action that both sides would approve. Success of the venture would depend not on a priori legal standards imposed from on high, as occurs with regimes of exclusive property rights, but on flexible arrangements that the members of the technical community develop in their collective self-interest.

Indeed, the real danger is that the technical community acting in its own self-interest adopts strategic responses that derogate, by mutual consent of innovators and borrowers, from the needs of the public. This could occur, for example, if collective action resulted in overly long periods of artificial lead time, or if user liabilities for unauthorized use of applied know-how were prolonged beyond the minimum period necessary to compensate innovators for the breakdown of classical trade secret

560. Cf. Stanley M. Besen et al., *An Economic Analysis of Copyright Collectives*, 78 Va. L. Rev. 383, 384 (1992) (copyright collectives, through the centralized administration of copyrights, lower collection costs and ultimately permit a greater number of transactions to occur); Zentaro Kitagawa, *Copyright Clearance or Copyright Sale?*, 117 Archiv für Urheber-, Film-, Funk-, und Theaterrecht [UFITA] 57, 64-69 (1991).

law. Collective action to lessen competition, rather than to enhance it, could thus emerge absent suitable oversight by public authorities in a form that the interested communities could not subvert or capture. Legislation recognizing and enabling the formation of agencies for collective action within the framework of an off-the-rack liability regime must, therefore, also provide for effective regulation of the designated collective actors.

C. Competition and Innovation in the Post-Industrial Economy

The advent of information-based products has caught the world's intellectual property system unprepared. Although policymakers expect competition to solve most of the resulting problems, competition breaks down in key sectors of the developed economies. In the past, competition presupposed both lead time and the practice of reverse engineering; the realities of innovation in the Age of Information cast doubt on the continued ability of pre-existing systems to function on this basis.

The shock of these changed conditions has induced policymakers to adopt reactive and ill-considered responses. One trend is to elevate and universalize international minimum standards of protection previously applicable to traditional objects of protection while pretending (and demanding) that new technologies be assimilated to these same objects of protection. A second is to address a pervasive market failure with an endless array of ad hoc, hybrid grants of exclusive intellectual property rights. Both solutions lessen competition, distort the market for unpatented innovation, and risk suffocating the very incremental advances they are supposed to stimulate. Neither response could successfully cope with simpler marginal cases that arose during the industrial revolution. A fortiori, they cannot cope adequately with artificial intelligence, multimedia, parallel systems, hypertext, and recombinant DNA.

Action must, therefore, be taken to separate that which works from that which does not, and to deal with new problems in new ways that avoid social harm within their own sphere of operations and that do not contaminate the larger sphere of commercial activity with a protectionist virus. To save the savable requires a peace pact between those pushing to maximize the protection of every innovation and those seeking to free ride at every opportunity. On the one hand, there must be no wholesale repeal of acquired rights; on the other hand, deformation of the world intellectual property system's master paradigms must cease, and governments must refrain from multiplying hybrid intellectual property regimes even at the wave of special-interest wands.

The developed economies should, instead, begin to elaborate—however experimentally—a quasi-liability regime that operates as a “portable” trade secret law. Such a regime cannot trigger any greater social harm than already results from existing regimes and, given its procompetitive thrust, ought significantly to diminish the harms flowing from present

trends. A default liability regime for know-how applied to industry will certainly do more to advance the cause of innovation in the technology-exporting countries than pending proposals to enact still more anticompetitive regimes of exclusive property rights. Such regimes can only weaken these countries with respect to newly industrialized countries in which the innovative instinct is strong and the forces of competition are not unduly blunted.

An experimental liability regime along these lines, once instituted, would itself compete with some of the misguided exclusive rights regimes that have emerged. If the proposed liability regime ultimately suffers in comparison with, say, the United Kingdom's unregistered design right, there is always time to universalize that peculiar regime. But if the unregistered design right turns out to be fool's gold that simply disguises trade restraints in the garb of intellectual property rights, then attempts to universalize it prematurely will undermine the very economies that pin their hopes on protection rather than sustained creative innovation.

If, instead, a default liability regime for applied know-how, loosely derived from classical trade secret law, succeeds in practice, it can be extended to the international system via the GATT/TRIPs Agreement and incorporated either within Article 10*bis* of the Paris Convention or within its own legislative niche.⁵⁶¹ If it fails, the experiment will enter history's dust bin along with other obsolete intellectual property regimes.

The time for examining a new approach, however, is at hand. The cause of innovation can not be entrusted to yet another round of multilateral trade negotiations driven by oligopolies that would rather litigate than innovate. Innovation in an age when information has become the common medium of construction⁵⁶² is unlike innovation in the past, and the nineteenth century's legal paradigms will not solve twenty-first century problems. Intellectual property law cannot escape evolutionary pressures that require adaptation and innovation as the price of survival.

The choice seems clear. Either the developed market economies will formulate a workable set of ancillary liability rules to replace the crippled regimes of trade secret protection, with particular regard to protecting applied scientific know-how, or they will founder in a tidal wave of ill-considered protectionist measures. One hopes that those who believe in competitive markets will intervene in time to restore order and to rescue a wayward intellectual property system from itself before that system, and the free market it indirectly sustains, collapses under its own protectionist weight.

561. See *supra* note 519.

562. See, e.g., Randall Davis, *Intellectual Property and Software: The Assumptions are Broken*, in *WIPO Symposium on Artificial Intelligence*, *supra* note 247, at 77, 102; *Manifesto*, *supra* note 61.