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Patents for Environmentalists

F. Scott Kieff*

When organizers of the National Association of Environmental Law Societies' (NAELS) annual meeting asked me to help explore the interface between patent policy and environmental policy, they wisely recognized that I know relatively little about the environmental side of this interface and consequently asked me to approach matters from the patent side instead. Therefore, this essay explains how patent law operates generally with an emphasis on how it may impact the environment in particular. In so doing, the essay addresses from a patent perspective some representative concerns relating to patents that appear to be prevalent in the environmental literature¹ and shows how the patent system may provide substantial benefit for those favoring the environment.

The environmental impact of the U.S. patent system can be best understood by first exploring the patent system's central goals and effects, as well as its general context. The central goal of the U.S. patent system is to provide an economic tool for promoting public access to new technologies.² While the central effect of the system

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1. I am indebted to the NAELS Conference organizers for identification of some representative issues in the environmental literature. Although limited independent research confirmed a similar set of issues, I am confident that a great many other issues exist at this interface and that they will be aptly addressed in due course by others.

2. See generally F. Scott Kieff, *Property Rights and Property Rules for Commercializing*

has been the achievement of this goal,³ the impact of such increased access is not an unmitigated good. For example, while some technologies when put to some uses may help the environment, others may hurt. This is where an understanding of context becomes important, because the patent system does not operate in a legal vacuum. The potential for harmful impact is well recognized and addressed by diverse parts of the U.S. legal system that regulate and in some cases prohibit the use of certain technologies, whether they happen to be patented or unpatented. Consider, for example, the extensive regulations administered by the Environmental Protection Agency (EPA) on the use of chemicals,⁴ those of the Food and Drug Administration (FDA) on the use of drugs,⁵ and those under many state laws on the use of firearms.⁶ To the extent that environmental interests are in favor of such restrictions on use, the interests need not be troubled by the patent system because the patent system gives the patentee only an additional right to exclude use of whatever is covered by the patent claim.⁷ Patents do not give patentees any right to use. Therefore, the patent system has no effect on other restrictions on use, whether the restrictions come from the environmental arena or elsewhere.

In contradistinction, to the extent that environmental and other interests are in favor of increased use, the patent system can provide

Inventions, 85 MINN. L. REV. 697 (2001) (showing how the patent system operates, by design, as an economic tool for promoting commercialization of new technologies). See also DONALD S. CHISUM ET AL., PRINCIPLES OF PATENT LAW 58-90 (2d ed. 2001) (reviewing incentive to commercialize and other incentive theories of the patent system).

3. Kieff, *supra* note 2, at 699-700 (collecting sources).

4. See generally Major Environmental Laws, available at <http://www.epa.gov/epahome/laws.htm> (last visited Apr. 19, 2002) (index of representative statutory foundations for the work of the Food and Drug Administration, including active internet links).

5. See generally Compilation of Laws Enforced by the U.S. Food and Drug Administration and Related Statutes, available at <http://www.fda.gov/opacom/laws/lawtoc.htm> (last visited Apr. 19, 2002) (index of representative statutory foundations for the work of the Food and Drug Administration, including active internet links).

6. See generally Department of the Treasury Bureau of Alcohol, Tobacco and Firearms State Laws and Published Ordinances-Firearms 22nd Edition, available at <http://www.atf.treas.gov/firearms/statelaws/22edition.htm> (last visited Apr. 19, 2002) (index of representative state laws regulating firearms, including active internet links).

7. U.S. patents give to the patentee only a right to exclude others from using whatever is claimed in the patent. See 35 U.S.C. § 154 (a) (1994) ("Every patent shall contain . . . a grant to the patentee . . . of the right to exclude others.").

great benefit. A central concern about patents that is expressed both generally, and specifically in the environmental literature,⁸ is the fear that the patent right to exclude use will cause patented technologies to be underused. But the patent literature teaches that the right to exclude use that is the core of the patent system's enforcement rules actually operates to increase use by facilitating *ex ante* investment in the complex, costly, and risky commercialization activities required to turn nascent inventions into new goods and services.⁹ This right to exclude competitors who have not shared in bearing the initial costs of commercialization provides incentives for the holder of the invention and the other players in this market to come together in an organized way and incur the costs necessary to facilitate commercialization of the patented invention.¹⁰ The drafters of our present patent system, the 1952 Patent Act, had precisely this concern for commercialization in mind when drafting the statute and were motivated by the specific fear that, for example, the handicapped in need of a new wheelchair might not find one to buy if the patent system did not provide an incentive for it to be brought to market in the first instance.¹¹

The patent system evolved a set of patentability rules such that the system can generate this increase in use while at the same time minimizing social costs, including those typically associated with

8. As discussed generally *supra* note 1, NAELS Conference meeting organizers suggested that I treat the work of Gollin and Derzko as representative of the environmental community's views on this particular issue. *See, e.g.*, Michael A. Gollin, *Using Intellectual Property to Improve Environmental Protection*, 4 HARV. J. L. & TECH. 193 (1991) (exploring the potential intellectual property protection has for promoting innovation in environmental technology); Michael A. Gollin, *Patent Law and the Environment/Technology Paradox*, 20 ENVTL. L. REP. 10171 (1990) (discussing the need to expand environmental law from merely controlling harmful technology to also encouraging beneficial technology and the model that patent law could provide for this); *see also, e.g.*, Natalie Derzko, *Using Intellectual Property Law and Regulatory Processes to Foster the Innovation and Diffusion of Environmental Technologies*, 20 HARV. ENVTL. L. REV. 3, 8 (1996) (exploring the problems for innovation in the current environmental regulatory scheme).

9. Kieff, *supra* note 2, at 707-10 (explaining how the right to exclude use promotes commercialization by facilitating the social ordering and bargaining around inventions that are necessary to generate output in the form of information about the invention, a product of the invention, or a useful embodiment of the invention).

10. *Id.*

11. *Id.* at 736-46 (showing how the drafters of the 1952 Patent Act were motivated by the commercialization theory and specifically contemplated such a wheelchair example).

information, administration, public choice, races for a common prize, and bargaining.¹² For example, patent law's requirements regarding the prior art, the § 102¹³ and § 103¹⁴ requirements that an invention be novel and non-obvious, operate to protect investments, including those by someone other than the patentee.¹⁵ In addition, the § 112¹⁶ disclosure requirements decrease social costs by giving clear notice about the property right, which both decreases the chance of inadvertent infringement and of duplicative efforts towards the same invention.¹⁷

The complex interactions in the patent system between the rules for enforcing and obtaining patents operate dynamically through the crux of the patent, the claim, to ensure that patents have a scope that is "just right."¹⁸ As Judge Rich often said about patents, "*the name of the game is the claim . . . [and] the function of claims is to enable everyone to know, without going through a lawsuit, what infringes the patent and what does not.*"¹⁹ According to Judge Rich, claims present a fundamental dilemma for every patentee because "the stronger a patent the weaker it is and the weaker a patent the stronger it is."²⁰ By this dilemma, he meant that a broad patent claim is strong

12. F. Scott Kieff, In response to the Notice for Public Hearings and Opportunity for Comment, Comments Regarding Competition & Intellectual Property, Summary of Proposed Testimony, available at <http://www.ftc.gov/os/comments/intelpropertycomments/harvardlaw.pdf> (last visited Mar. 13, 2002) (showing how positive patent law rules, particularly those for obtaining patents, operate to minimize social costs).

13. 35 U.S.C. § 102 (1994) (novelty and statutory bars).

14. 35 U.S.C. § 103 (1994) (nonobviousness).

15. Kieff, *supra* note 12, at 6. In this sense, the novelty requirement can be viewed as a tool for ensuring that patents do not issue on anything others are already doing and the non-obviousness requirement can be viewed as a tool for ensuring that patents do not issue on anything that others are about to do.

16. 35 U.S.C. § 112 ¶¶ 1-2 (1994) (setting forth the disclosure requirements of patent law: (1) written description; (2) enablement; (3) best mode; and (4) definiteness, which is also stated as the requirement that the claims particularly point out and distinctly claim).

17. Kieff, *supra* note 12, at 6.

18. *Id.* at 9-10.

19. See, e.g., Giles S. Rich, *The Extent of the Protection and Interpretation of Claims—American Perspectives*, 21 INT'L REV. INDUS. PROP. & COPYRIGHT L. 497, 499, 501 (1990) (quoted in *Hilton Davis Chem. Co. v. Warner-Jenkinson Co.*, 62 F.3d 1512, 1539 (Plager, J., joined by Archer, J.; Rich, J; and Laurie, J., dissenting)) (emphasis in original).

20. See, e.g., Giles S. Rich, *The Proposed Patent Legislation: Some Comments*, 35 GEO. WASH. L. REV. 641, 644 (1967) (responding to proposed legislation S. 1042 and H.R. 5924, 90th Cong. (1967) and Report of the President's Commission on the Patent System (1966)).

on offense because it covers more and therefore is more likely to be infringed, but it also is weak on defense because it may cover something in the prior art or fail to contain a sufficiently detailed disclosure, and therefore is more likely to be invalid; while a narrow claim is weak on offense, because it covers less and therefore is less likely to be infringed, but it also is strong on defense because it is less likely to cover something in the prior art or fail to contain a sufficiently detailed disclosure, and therefore also is less likely to be invalid.²¹

Patents vetted through such a self-disciplining regime can form the basis of licensing transactions with others seeking permission from the patentee to practice whatever is claimed in the patent. These transactions allow those seeking use to obtain permission for use. For example, a patented technology that has beneficial environmental impact can be licensed to all those who wish to achieve that impact.

Importantly, the patent system has developed a set of rules about licensing that operate *ex post* to maximize the likelihood that all those wanting such use will get it. Putative licensees who place a high value on such use and those who place a low value on such use are both attractive targets to a patentee as long as the patentee is allowed to set a different price for different users. This practice is called price discrimination. Patent law allows patentees to price discriminate among such licensees because this gives patentees a strong financial incentive to ensure all those desiring use get use; even a monopolist who can price discriminate will push output to the full competitive output level.²² Such beneficial price discrimination can take place because patent law, and contract law, allow for the enforcement of the restrictive licenses needed to prevent arbitrage between low value and high value users.²³ In the presence of such a system, a patentee is

21. *Id.* (explaining patentee's dilemma, or in his words, "puzzle").

22. Kieff, *supra* note 2, at 727-32 (showing how the patent system's facilitation of tie-ins and other forms of price discrimination where technological and economic factors alone might prevent price discrimination together provide incentives for the patentee to elect to keep output at competitive levels).

23. *Id.* The prevention of arbitrage is essential for price discrimination to work. For example, those obtaining senior citizen discounts could sell their low price tickets to patrons who would otherwise have to pay full price if movie theatres did not require some proof of age on admission, which may be as simple as looking at the ticket holder.

rationally motivated to avoid posting an excessive price because to do so would scare away would-be paying customers and this result would be a money-losing venture.

Even where the user is not able to pay any positive price, the patentee may be rationally motivated to grant a license for free. The granting of a free license may provide the patentee with an inexpensive way to preserve the legal force of the patent property right for use in other transactions with paying customers.²⁴ The patentee may also be able to derive advertising benefits from such uses as long as they are successful uses and their low price does not cause customer-relations harm with the high-paying customer base.²⁵ Thus, even very low value users are likely to be able to obtain licenses from the patentee.

Some argue that while patentees may be rationally motivated to sell permission to each user, and users may be rationally motivated to buy permission from patentees, such sales may not be consummated because of various market failures.²⁶ In response to these concerns,

24. F. Scott Kieff, *Facilitating Scientific Research: Intellectual Property Rights and the Norms of Science—A Response to Rai & Eisenberg*, 95 NW. U. L. REV. 691, 705 (2001) (discussing a property owner's rational decision to allow free users so as to avoid the cost of monitoring low value uses while preserving the full scope of the property right for other high value uses).

25. Giving away product to the poor will force the patentee to wrestle with a delicate customer-relations balance. On the one hand, paying customers may be offended to learn of the availability of a price that is lower, or even zero. On the other hand, paying customers may be motivated to buy when they learn of both the patented technology's success and the patentee's seemingly charitable contributions. Although it may seem crass to call such a contribution "charitable," since its purpose is the facilitation of some other objective (charging a higher price to some customers), presumably every donation willingly made to a charitable cause by a rational actor is done to further some objective of that actor and not to further only someone else's objective. While the net impact of these competing forces is uncertain, the patentee's desires to preserve value while avoiding transaction costs that are discussed *infra* note 24 will likely tip the net balance of incentives to be towards the use of such free licenses in certain cases.

26. This argument and its implications are explored in depth in the important works by Eisenberg et al. See, e.g., Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCIENCE 698 (1998) (arguing that patents can deter innovation in the field of basic biological research); Rebecca S. Eisenberg, *Property Rights and the Norms of Science in Biotechnology Research*, 97 YALE L.J. 177 (1987) (exploring potential negative impact of patent rights on scientific norms in the field of basic biological research); Rebecca S. Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, 56 U. CHI. L. REV. 1017 (1989) (exploring an experimental use exemption from patent infringement as a device for alleviating potential negative impact of

some commentators argue that patents should be protected by a liability rule²⁷ instead of a property rule.²⁸

Indeed, there are already important liability rule provisions in patent law today. Otherwise infringing uses that are by or for the federal government enjoy sovereign immunity protection that effectively results in a compulsory licensing regime.²⁹ In addition, the high costs of litigation under the present rules of civil procedure and the ability for an infringer to be kept effectively judgment proof through corporate and bankruptcy laws may also operate as a form of liability rule gloss on the present property rule regime.³⁰

Not only is the market power of the patent not as strong as it may seem,³¹ it may have the beneficial effect of inducing even more new technologies. To the extent that some would-be licensees may not be able to obtain permission for use despite manifesting some

patent rights on scientific norms in the field of basic biological research); Rebecca S. Eisenberg, *Public Research and Private Development: Patents & Technology Transfer in Government-Sponsored Research*, 82 VA. L. REV. 1663 (1996) (offering preliminary observations about the empirical record of the use of patents in the field of basic biological research and recommending a retreat from present government policies of promoting patents in that field).

27. An entitlement enjoys the protection of a property rule if the law condones its surrender only through voluntary exchange. The holder of such an entitlement is allowed to enjoin infringement. An entitlement has the lesser protection of a liability rule if it can be lost lawfully to anyone willing to pay some court-determined compensation. The holder of such an entitlement is only entitled to damages caused by infringement. See Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089 (1972); see also Jules L. Coleman & Jody Kraus, *Rethinking the Theory of Legal Rights*, 95 YALE L.J. 1335 (1986).

28. See, e.g., Ian Ayres & Paul Klemperer, *Limiting Patentees' Market Power Without Reducing Innovation Incentives: The Perverse Benefits of Uncertainty and Non-Injunctive Remedies*, 97 MICH. L. REV. 985 (1999) (criticizing recent increases in certainty in patent law and suggesting the use of liability rules instead of property rules for patent enforcement).

29. 28 U.S.C. § 1498 (1994) (providing limited waiver of sovereign immunity for acts of infringement by or for the federal government and instead allowing suits against the government in the U.S. Court of Federal Claims for a reasonable royalty).

30. As explained more fully in Kieff, *supra* note 2:

Concerning procedure, litigation costs may be high enough to prevent the patentee from seeking court intervention against an infringer. Concerning substance, the limitations on liability that are available to a would-be infringer through the use of the corporate form or bankruptcy laws, for example, may encourage acts of infringements that are essentially judgment proof.

Id. at 734 n.154.

31. In addition to the infringement threats discussed *supra* in the text accompanying notes 29-30, the patentee faces market threats from old technologies, alternative non-infringing technologies, and future technologies. See Kieff, *supra* note 2, at 729-31 (collecting sources).

willingness to pay some positive price,³² the presence of such potential customers and the potential for an independent patent each provide incentives for others to bring to market some alternative non-infringing substitute.³³

Moreover, the political process provides several solutions for would-be licensees. They may prevail on the government simply to provide such use in particular cases.³⁴ They may alternatively prevail on the government to subsidize their ability to pay.³⁵

Ensuring an environmental use through a switch in the patent system towards over-all liability rule treatment should be avoided because these other remedies are available and because such a shift will frustrate the important goals of the patent system, including those that are specifically pro-environment, such as the commercialization of beneficial technologies. The use of liability rules would lead to a net increase in social cost and frustrate the very efforts for ordering and bargaining around patents that are necessary to generate output of patented inventions in the first instance, thereby decreasing over-all social access to new technologies.³⁶ As recognized by Merges, it is precisely because private parties have a comparative advantage over courts in valuing patents and patented inventions that a property rule is likely to work better than a liability

32. *See id.* at 731 (discussing possibility that some licensees may not be able to obtain permission to use the patented invention).

33. *See* CHISUM ET AL., *supra* note 2, at 75-76 (discussing incentive to design around patented inventions).

34. *See supra* text accompanying note 29. The recent public demand for the patented drug Cipro® to treat anthrax infection provides an example from the healthcare arena of just such behavior. *See, e.g.*, Terence Chea, *Vaccines Are Hot Topic, But Not Hot Investment*, WASH. POST, Dec. 13, 2001, at E1. "At the height of the anthrax crisis, government officials considered overriding German drugmaker Bayer AG's Cipro patent to purchase pills at a better price. Under threat of losing its patent, Bayer agreed to sell the government the antibiotic at half price." *Id.*

35. *See* Douglas Gary Lichtman, *Pricing Prozac: Why the Government Should Subsidize the Purchase of Patented Pharmaceuticals*, 11 HARV. J.L. & TECH. 123, 124-25 (1997) (arguing that the government offer a cash subsidy to any consumer who values a patented good above marginal cost but is unwilling or unable to pay to such a price). *Cf.* Kieff, *supra* note 2, at 716 n.91 (noting that such proposals face the distortion and implementation concerns generally raised against subsidies).

36. Kieff, *supra* note 2, at 732-36 (showing how the potential infringements induced by a liability rule will discourage investment in the commercialization process *ex ante* and may even result in a net destruction of social wealth if the collective costs of entry and exit across infringers exceeds the social surplus otherwise created by the invention).

rule according to the established test for choosing between the two types of regimes.³⁷

The ability to exclude use through a patent not only facilitates increased use, it also provides individual actors with a legal alternative to self-help approaches that may have more pernicious impact on the ability to obtain use.³⁸ Consider, for example, the concern expressed in the environmental literature about a form of self-help in the agricultural sector called “terminator technologies” and the fear that these might cause environmentally important plant species to die out.³⁹ Terminator technology refers to seeds that were genetically altered so as to yield crops whose resulting seed will be sterile.⁴⁰ The technology prevents farmers from harvesting seeds from crops they have grown using genetically engineered seeds, thereby forcing farmers to buy more of the original seed each planting season.⁴¹ Terminator technology can also be thought of as the agricultural equivalent of copy protection technology in the software industry.

Such terminator and copy protection technologies are each a form of self-help that can be used as an alternative to legal protection in a way that is likely to be more costly than legal protection. Consider a market for some modified form of seed that was altered so as to make it especially valuable compared to other seeds. Since seeds generate plants that in turn produce more seeds, the sale of a seed must take into account the potential of vast progeny seeds that are themselves

37. *Id.* at 734 n.152. (citing Robert P. Merges, *Of Property Rules, Coase, and Intellectual Property*, 94 COLUM. L. REV. 2655, 2664 (1994)).

38. *See, e.g.*, *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 486-87 (1974) (Burger, C.J.) (highlighting, in the context of a discussion about the benefits of allowing even the lesser form of protection provided by trade secret laws, social costs of the self-help measures that would be used by individual actors if legal forms of protection were not available).

39. As discussed generally *supra* note 1, on this particular issue, NAELS Conference organizers suggested that I treat as representative of the environmental community’s views the work of Ozcek and Evans. *See, e.g.*, Jeremy P. Ozcek, Note, *In the Aftermath of the “Terminator” Technology Controversy: Intellectual Property Protections for Genetically Engineered Seeds and the Right to Save and Replant Seed*, 41 B.C. L. REV. 627 (2000) (exploring the problems associated with so-called “terminator technologies”); Laura E. Ewens, Note, *Seed Wars: Biotechnology, Intellectual Property, and the Quest for High Yield Seeds*, 23 B.C. INT’L & COMP. L. REV. 285, 307 (2000) (same).

40. One example of such terminator technology is the Technology Protection System™ from Monsanto. Ozcek, *supra* note 39, at 628.

41. *Id.* at 629; Ewens, *supra* note 39, at 306-07.

potent for germination. The seller must consider the risk that the buyer will generate maximal progeny, maybe even returning to the market to sell some progeny seeds in competition with the original seller. The price needed to cover for this risk will far exceed the price needed to cover a sale to a farmer who will only use the seed for production of a single crop and who will not generate progeny seed. Buyers seeking seed for the purpose of growing such a single crop will want to identify themselves convincingly to sellers. Sellers' willingness to sell to such buyers at the lower price will decrease to the extent the seller disbelieves that the buyer indeed intends to and will use the seed for a single crop. As a result, both pricing and consummation of that sale are frustrated. In contradistinction, terminator technology ensures that both sides of the sale will keep to its terms. Because both seller and buyer know the seed will only be of value for a single crop, pricing and consummation of that sale are facilitated.

But technological self-help is not needed if a legal device will have the same effect, especially if the legal device will be cheaper. One legal device may be a contract for sale having a restrictive term, such as a clause agreeing that the seed will only be used for a single crop. A problem with such a contract may be that it will have enforcement problems. The ordinary contract remedy of expectation damages is likely to under deter breach.⁴² In addition, contract remedies will have difficulty reaching any third-party transferees of progeny seeds. Patent law offers a convenient aid because patents can be licensed with restrictive terms and patent remedies include the right to an injunction against any infringer, including both third parties and those in contract privity with the patentee.⁴³ For this reason, courts uphold patent licenses that restrict buyers to a single use.⁴⁴ Indeed, restrictive patent licenses have the added advantage of

42. See, e.g., Fred S. McChesney, *Tortious Interference With Contract Versus "Efficient" Breach: Theory and Empirical Evidence*, 28 J. LEGAL STUD. 131 (1999) (arguing that so-called efficient breaches of contracts are often not efficient when viewed from the dynamic perspective).

43. See, e.g., CHISUM ET AL., *supra* note 2, at 1223-1308 (discussing patent remedies including the right to an injunction and, where infringement is willful, to attorney fees and treble damages).

44. See, e.g., *Mallinkrodt v. Medipart*, 976 F.2d 700 (Fed. Cir. 1992) (holding single-use

avoiding the potential risk of some harmful biological consequences that are feared to be associated with self-help devices like the terminator technology, such as the potential for its accidental spread to other plants for which germination is otherwise desired.⁴⁵ Therefore, patents, especially when used with enforceable restrictive patent licenses, may be important tools for avoiding environmental concerns with terminator technologies.

Finally, the patent system can also offer some help to those environmentalists who are concerned about the need to ensure resources for custodians of biodiversity.⁴⁶ While developing nations are often the custodians of biodiversity, they are often excluded from sharing in the benefits of the patents that derive from such biodiversity.⁴⁷ But the enforcement of property rights should lead to an arrangement in which those benefits are shared with the custodians.⁴⁸ For example, intellectual property rights in the United States have been long recognized to be a critical factor in creating

restriction on patented catheter enforceable).

45. One feared mechanism by which such pernicious spreading of terminator technologies might take place is discussed in Kojo Yelapaala, *Owning The Secret Of Life: Biotechnology And Property Rights Revisited*, 32 MCGEORGE L. REV. 111 (2000).

Terminator Seed technology has the potential for serious environmental damage. Through cross-pollination, the Terminator Seed technology could spread from farm to farm and into other varieties of seeds. Given that the Terminator Seed technology can be combined with ordinary non-patented seeds and with other genetically engineered technologies such as the herbicide-resistant plant technology, the spread of the Terminator Seed technology would be virtually unstoppable. Imagine the thousands of different varieties of maize in Mexico being exposed to the Terminator Seed technology from a few farms. With time the technology could threaten the biodiversity of seeds in Mexico.

Id. at 209.

46. As discussed generally *supra* note 1, on this particular issue, NAELS Conference organizers suggested that I treat as representative of the environmental community's views the work of my colleague, McManis. See, e.g., Charles R. McManis, *The Interface Between International Intellectual Property and Environmental Protection: Biodiversity and Biotechnology*, 76 WASH. U. L.Q. 255 (1998) (exploring the influence of patent law on biodiversity).

47. See McManis, *supra* note 46, at 268-70 (arguing that Article 16 of the Biodiversity Treaty attempts to ensure that profits are shared with indigenous populations who are custodians of such biodiversity); see also Ewans, *supra* note 39, at 289 (commenting on the failure to share such patent profits with indigenous populations).

48. Gollin, *supra* note 8, at 216 (noting that grants of proprietary rights may permit such a system of sharing to develop through private agreements and international initiatives).

national wealth,⁴⁹ and this pool of financial wealth is available in at least several senses for use in helping the biodiversity custodians. Those having the pool of financial wealth may elect to share it through general international subsidies. They may also be encouraged to exchange some of that financial wealth for some continued access to the pool of biodiversity wealth. To the extent that those granting access to the biodiversity wealth have not had a fair shot when forging such deals, efforts to ensure legal representation during contract negotiations between indigenous cultures and bio-prospectors might provide one solution.⁵⁰ But it is important to realize that regardless of which method is used to allocate the wealth created by the patent system, a robust protection for patents must be maintained or the wealth itself will be sacrificed.

In conclusion, the patent system may be good for environmentalists because it increases public access to new technologies, decreases use of environmentally dangerous self-help approaches, and increases the wealth available for all purposes, including helping the custodians of biodiversity. To the extent new technologies are helpful to environmental goals, such as cleaner burning engines, the patent system can be seen as generating environmental good by providing incentives for their commercialization *ex ante*. To the extent new technologies are harmful to environmental goals, such as poisonous chemicals, the patent system can be seen as at least not causing environmental damage because the patent right to exclude use would not interfere with a regulatory system's own effort to exclude use. To the extent environmentalists are concerned about *ex post* ability to gain access

49. See Kieff, *supra* note 2, at 699 n.4 ("Economic research over the past sixty years has amply established a causal link between the development of intellectual property and the growth of our national economy, while also showing that intellectual property is an increasingly critical component of United States capital and foreign trade.")

50. Indeed, McManis and others devoted substantial personal effort towards this end, and we are indebted for the example they provide. Moreover, even where express individualized contracting cannot be achieved, an international treaty could be created to essentially impose a tax on gains from patents generated through access to such cultures and then transfer the proceeds from such a tax to the custodians. But each of these solutions raises yet other serious problems. For example, it may be quite difficult to identify who "merits" treatment as "custodian" of biodiversity. The national government, a local government, a tribal unit, a family unit, a political leader, a military leader, a spiritual leader, or some host of other individuals and organizations might each lay claim to that status or interfere with the claims by the others.

to technologies covered by a patent right to exclude use, the patent system's rules about licensing and price discrimination encourage patentees to seek out and license as many users as possible, even low value users. Moreover, to the extent environmentalists are concerned about dangerous self-help approaches, such as the terminator technologies that might be used by sellers of agricultural products, the patent system provides these sellers with a more attractive option that also poses less potential danger for the environment. Finally, to the extent environmentalists are concerned about helping custodians of biodiversity, the patent system creates economic wealth from such biodiversity that is then available for allocation among its custodians and users according to ordinary market and political mechanisms. Therefore, those who care about the environment ought to care about patents precisely because the present patent system may be so beneficial for the environment.