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THE ACCESSION INSIGHT AND PATENT INFRINGEMENT REMEDIES

Peter Lee*

What is the appropriate allocation of rights and obligations when one party, without authorization, substantially improves the property of another? According to the doctrine of accession, a good faith improver may take title to such improved property, subject to compensating the original owner for the value of the source materials. While shifting title to a converter seems like a remarkable remedy, this outcome merely underscores the equitable nature of accession, which aims for fair allocation of property rights and compensation between two parties who both have plausible claims to an improved asset.

This Article draws upon accession—a physical property doctrine with roots in Roman civil law—to enhance patent law’s treatment of technological improvement. While patents and property exhibit significant differences, this Article argues that accession—with some modification—can provide valuable guidance for allocating rights and obligations when an infringer substantially improves on another party’s patented technology. Drawing on the Supreme Court’s decision in eBay v. MercExchange, it proposes that courts apply accession in equitable determinations to deny injunctive relief and compel “substantially improving” infringers to compensate patentees through ongoing royalties. Accession would thus shift meaningful ownership of enhanced technologies to improvers based in part on their substantial contributions to those technologies. Such liability-rule protection would ameliorate holdup in “blocking patents” scenarios, provide a viable alternative to the rarely used reverse doctrine of equivalents, and encourage the dissemination of improved technologies. While this proposal seems radical, this Article shows that elements of the “accession insight” already appear in eBay and its progeny. The Article concludes by exploring the theoretical implications of accession for the intersection of patents and property.

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INTRODUCTION

George Wetherbee probably thought he had a pretty good deal. Relying on a seemingly valid license, he chopped down $25 worth of trees on land owned by another party and used the lumber to make barrel hoops valued at
about $700. Unfortunately, Wetherbee’s license was faulty, and the true owners of the trees sued for return of the hoops derived from their wood. At trial, Wetherbee argued to keep the hoops, testifying that he had acted in good faith while significantly enhancing the value of the underlying lumber. The trial court excluded this testimony and entered judgment for the plaintiffs. However, the Supreme Court of Michigan reversed on appeal. Invoking the doctrine of accession, the court observed, “If a thing is changed into a different species, as by making wine out of another’s grapes . . . the product belongs to the new operator, who is only to make satisfaction to the former proprietor for the material converted.” Applying accession, the court held that if Wetherbee had acted in good faith and substantially transformed the underlying wood, title to the hoops would transfer to Wetherbee as long as he compensated the original owners for the value of the source materials.

While George Wetherbee’s story is real, now consider the hypothetical story of his fictitious great-great-granddaughter, Dr. Georgiana Wetherbee. Dr. Wetherbee is an engineer who invents and patents a revolutionary new battery. After Dr. Wetherbee has invested in personnel and equipment to start large-scale production of her battery, a firm sues her for patent infringement. Given the existence of a “blocking patent,” Dr. Wetherbee and the firm attempt to negotiate a license to allow Dr. Wetherbee to manufacture the improved battery. However, high transaction costs, distrust between the parties, and the firm’s desire to extract as much surplus as possible derail negotiations. The firm presses on with its infringement suit, threatening to obtain and enforce an injunction against Dr. Wetherbee unless she pays an exorbitantly high licensing fee. In the meantime, the improved battery sits in limbo, and the prospects for commercializing it grow dim.

Although these two examples are distinguishable on many grounds, they nevertheless revolve around a central question: What is the appropriate allocation of rights and obligations when one party, without authorization, substantially improves the property of another? In the physical property realm, this question informs a curious line of cases involving individuals who improve other people’s chattels and parties who build houses on other people’s land. In the patent sphere, this question is critical to technological improvement, particularly to instances in which a substantial technological

1. Wetherbee v. Green, 22 Mich. 311, 312 (1871).
2. Id.
3. Id. at 321.
4. Id. at 315 (quoting 2 WILLIAM BLACKSTONE, COMMENTARIES *404).
5. Id. at 321.
6. See infra Section I.A.
7. I use the term “physical property” to encompass the traditional categories of both real and personal property.
8. See infra Section III.A.
advance infringes an existing patent. While these situations are quite distinct, this Article argues that physical property doctrine provides insightful guidance for enhancing patent law's treatment of technological improvement.

Patent law has a complicated relationship with property. While numerous authorities have long recognized conceptual similarities between patents and physical property, scholars have consistently questioned this comparison. An important Supreme Court case dealing with patent infringement remedies has further complicated the landscape. In eBay Inc. v. MercExchange, L.L.C., the Supreme Court first affirmed a conception of patents as property and then clarified that "the creation of a [property] right is distinct from the provision of remedies for violations of that right." Thus, the Court implicitly acknowledged that protecting a property right did not necessarily require a property rule, which is characterized by injunctive relief. In so doing, the Court rejected a per se rule favoring injunctions and established a multifactor, equitable framework for determining the appropriateness of injunctive relief following a finding of patent infringement. As a corollary, the Court opened the door to protecting patents with a liability rule, which is characterized in this context by allowing continued infringement contingent on the defendant paying ongoing royalties to the patentee.

This Article builds on eBay to show how traditional property principles can illuminate a more fruitful approach to technological improvement in patent law. This Article fully acknowledges that the analogy between patents and physical property is not perfect. Rather than reject it wholesale, however, this Article explores a specific context in which the analogy is surprisingly helpful. In particular, it argues that the traditional doctrine of accession provides valuable insight for determining remedies when a new technology substantially improves on but infringes an existing patent. Working within the eBay framework, this Article proposes that courts apply accession principles—with some modification—to deny injunctive relief in cases in which an infringing product substantially improves on a patented invention. Rather, courts should compel the infringer to compensate the patentee through ongoing royalties. Drawing on concepts from physical

9. See infra notes 86–89 and accompanying text.
10. See infra notes 95–108 and accompanying text.
13. eBay, 547 U.S. at 391.
14. Cf. Anupam Chander, Minorities, Shareholder and Otherwise, 113 YALE L.J. 119, 152 (2003) (comparing minorities in the shareholder and constitutional contexts and noting that "[s]uch intradisciplinarity seems especially appropriate to law, a discipline that relies on analogical reasoning").
15. See infra Section IV.A.1.
property law, this Article argues that when a substantially improved technology infringes a patent, courts should protect that patent with a liability rule rather than a property rule.

In offering this proposal, this Article draws on (and, in some cases, challenges) previous scholarly applications of accession to intellectual property, including the application of accession to inform patent infringement remedies. While commentators emphasize the technical difficulties of protecting patents with liability rules, this Article finds new support for the desirability and feasibility of applying the “accession insight” in recent case law addressing patent injunctions and damages. Furthermore, it draws on theoretical and empirical work to show that liability-rule regimes may be highly conducive to private ordering between patentees and potential infringers, thus mitigating a significant objection to such modes of patent protection.

While accession takes many forms, this Article focuses on doctrines governing “mistaken improvement” of someone else’s personal property. Similar to Wetherbee, if A unknowingly trespasses on B’s land, chops down B’s trees, and fashions the resulting wood into an exquisite chair, the doctrine of accession grants title to that chair to A, subject to A’s compensation of B for the raw materials. Of course, shifting title to a party who converts personal property represents an extraordinary remedy. However, this outcome merely underscores the equitable nature of accession, which aims for fair allocation of property rights and compensation between two parties who both have plausible claims to an improved item.

Under this proposal, courts would consider the value of an infringing improver’s contribution over the original patent in determining appropriate remedies. If the improvement is slight, then (all other things being equal) traditional equitable principles would favor enjoining infringement. Thus, in the vast majority of “infringing improvement” cases that merely involve “incremental” improvement, accession would not apply. If, however, the improver’s contribution dominates the value of the improved technology, then courts applying the eBay framework could deny injunctive relief. Such improvement would be particularly apparent if the new technology transformed the underlying patented invention (yet still infringed the patent). In adapting accession to patent law, this proposal contemplates some divergence from traditional doctrine, particularly with respect to the requirement of good faith. For reasons explained below, good faith would be a factor that


18. See 2 WILLIAM BLACKSTONE, COMMENTARIES *404–07.


20. See infra Section I.A.
weighs in favor of liability-rule protection of an infringed patent but would not be a threshold requirement. If the court denied an injunction, it would then direct the infringer and the pioneer patentee to negotiate an ongoing royalty. If the parties failed to do so, the court would determine a royalty itself and compel the infringer to compensate the patentee accordingly.

This proposal addresses several limitations in patent law's treatment of technological improvement. In general, a patentee enjoys exclusive rights over any technology that infringes her claims, even if that technology substantially improves on her original creation. For certain improvements, patent law relies on "blocking patents" held by the pioneer and improver to motivate voluntary licensing, thus allowing one or both parties to practice the improved technology. However, as suggested above, transaction costs and strategic behavior may prevent such agreements from arising. Additionally, while in theory the "reverse doctrine of equivalents" eliminates infringement liability for those who radically improve on patented inventions, courts rarely invoke it. The current proposal mitigates the strict right to exclude normally enjoyed by patentees, thereby ameliorating the difficulties of negotiations under the blocking patents regime and offering a viable alternative to the reverse doctrine of equivalents.

While this proposal may seem radical at first glance, in many ways this notion of weighing relative technological contributions by multiple parties is already evident in eBay itself as well as several cases applying it. The accession insight thus does not deviate markedly from existing precedent, but arises organically from within it.

21. Indeed, the particularities of patent law as well as the availability of other mechanisms to discipline strategic assertions of accession counsel against adopting a strict mental state requirement. See infra Section IV.A.1.

22. In this Article, I use the term "pioneer" in the context of a simple dynamic system where an original, or pioneer, inventor patents some technology that a subsequent party then improves. I do not confine my use of this term to the historical "pioneer patents" doctrine whereby patents covering groundbreaking inventions receive broad judicial construction. See Michael J. Meurer & Craig Allen Nard, Invention, Refinement and Patent Claim Scope: A New Perspective on the Doctrine of Equivalents, 93 GEO. L.J. 1947, 2002-03 (2005).

23. As this Article explains more fully below, conversion of patent protection from a property rule to a liability rule does not displace private negotiations over royalty payments; it merely changes the baseline conditions against which such negotiations take place. See Daniel A. Crane, Intellectual Liability, 88 TEX. L. REV. 253, 258 (2009) [hereinafter Crane, Intellectual Liability]; infra Sections IV.A.3, V.A.2.

24. While this analysis focuses on the appropriateness of injunctive relief, it necessarily intersects with recent doctrine clarifying the determination of patent infringement damages. See infra Section V.B.2.

25. One exception to this general rule is the reverse doctrine of equivalents. See infra notes 76-80 and accompanying text.

26. Additionally, the agreement may allow the initial patentee to obtain an undue proportion of the rents arising from the improvement, thus diminishing incentives to improve.

27. See infra notes 76-80 and accompanying text.

28. See infra Section IV.B.
Part I surveys patent law's treatment of technological improvement and explores how a substantial improvement to a patented technology may nonetheless infringe the underlying patent. To begin to develop a new approach to technological improvement, Part II turns to the intersection of patents and property, and in particular to the flexible conception of property rights arising from the Supreme Court's eBay decision. Part III examines the physical property doctrine of accession, whereby an innocent improver's value-enhancing contributions to someone else's property may result in title shifting to the improver, contingent upon compensating the prior owner for the value of the source materials. Part IV draws on accession doctrine to propose enhancements to patent infringement remedies analysis. Under this proposal, courts would extend liability-rule protection when an infringer substantially improves on an underlying patented invention. Among other considerations, Part IV argues that this seemingly radical proposal is conceptually consistent with eBay and its progeny. Part V explores the unique advantages of this proposal as well as responds to several prominent objections relating to valuation difficulties and perverse incentives. Finally, Part VI explores further implications of this proposal for patent law and the intersection of patents and property.

I. PATENT LAW'S TREATMENT OF TECHNOLOGICAL IMPROVEMENT

The patent system seeks to promote technological progress by conferring exclusive rights on new inventions. These exclusive rights can be quite broad, which both enhances incentives to invent and provides patentees with significant control over the subsequent development of a patented technology. In granting such broad exclusive rights, however, the patent system can significantly complicate attempts by other parties to improve on existing patented inventions. These complications are particularly problematic given that much innovation is cumulative in nature. Paradoxically,
by providing strong incentives to invent, the patent system may chill incentives to improve on existing inventions.\textsuperscript{32}

To understand the broad control that patents confer over technological improvements, one must understand the nature of patent claiming.\textsuperscript{33} All patents conclude with one or more claims, which are highly stylized sentences "particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention."\textsuperscript{34} The scope of patent rights—and whether an accused product infringes those rights—depends on these claims,\textsuperscript{35} which may be much broader than any physical embodiment that the patentee actually created.\textsuperscript{36} As Robert Merges observes, "In practice, clever lawyering can often produce a patent claim that covers more technological ground than is truly warranted by the underlying invention."\textsuperscript{37}

To use a fanciful example, the original inventor of the chair could plausibly claim "a flat sitting surface held parallel to the ground at a height conducive to sitting by at least three support structures."\textsuperscript{38} Even if this inventor had simply attached three wooden legs to a wooden seat, she would have exclusive rights over a wide variety of chairs of different shapes, materials, and designs. Of course, the requirements of patent disclosure, particularly that a patent adequately describe an invention\textsuperscript{39} and enable a technical arti-


\textsuperscript{33} Lemley, \textit{Economics of Improvement}, supra note 31, at 1000 ("The key to understanding the treatment of improvements in patent law is recognizing that patents are legally defined by the language of the patent's claims, not by what the patent owner has actually invented or built.").


\textsuperscript{35} See \textit{In re Warmerdam}, 33 F.3d 1354, 1360 (Fed. Cir. 1994) (noting that patent claims define the "metes and bounds" of an invention).

\textsuperscript{36} See Jeffrey A. Lefstin, \textit{The Formal Structure of Patent Law and the Limits of Enablement}, 23 \textit{Berkeley Tech. L.J.} 1141, 1169 (2008) ("[P]atent claims define the scope of the inventor's rights by reciting properties; all things having those properties fall within the scope of a patent's claims.").


\textsuperscript{38} Of course, this claim could be written in an infinite number of ways. For an additional example, see Lefstin, supra note 36, at 1169.

\textsuperscript{39} See, e.g., Ariad Pharm., Inc. v. Eli Lilly & Co., 598 F.3d 1336 (Fed. Cir. 2010) (en banc) (reaffirming the written description requirement as a distinct criterion of patentability independent of enablement).
san to make and use it,\textsuperscript{40} constrain the scope of exclusive rights.\textsuperscript{41} Nevertheless, the scope of a claim commonly ranges well beyond the physical embodiments (if any) created by the inventor. Thus, many "improvements" to this original chair—such as using metal instead of wood, attaching four legs instead of three, or creating a chair with a back and armrests—could conceivably infringe the original patent.

In this fashion, a pioneer patentee’s right to exclude may extend to products and processes that "improve" on an original invention but still infringe one or more patent claims.\textsuperscript{42} One widely cited case demonstrating this phenomenon involves satellite technology. In \textit{Hughes Aircraft Co. v. United States}, Hughes had patented a system by which a satellite sent data to Earth for calculations and received outputs that helped orient the satellite in space.\textsuperscript{43} Another party developed a more advanced system in which the satellite could perform several of these functions onboard.\textsuperscript{44} Although the second invention represented an "improvement" over the original patent, the Court of Appeals for the Federal Circuit held that it infringed the original patent under the doctrine of equivalents.\textsuperscript{45} Thus Hughes, relying on its patent, had a right to exclude the infringer from practicing its improved technology. As this example suggests, by conferring broad exclusive rights to pioneers, patent law may impose significant costs on parties who improve on existing inventions.\textsuperscript{46}

\textsuperscript{40} See, e.g., \textit{In re Wands}, 858 F.2d 731 (Fed. Cir. 1988) (describing a set of factors used to determine whether a patent requires "undue experimentation" to practice, thus failing the enablement requirement).

\textsuperscript{41} See Merges & Nelson, \textit{supra} note 31, at 845–52 (exploring the role of the disclosure requirements in calibrating patent scope).

\textsuperscript{42} Patent law recognizes two types of infringement: (1) literal infringement, in which the accused product or process falls within the literal text of a patent claim; and (2) infringement under the doctrine of equivalents, which "casts around a claim a penumbra which also must be avoided . . . ." Autogiro Co. of Am. v. United States, 384 F.2d 391, 400 (Ct. Cl. 1967). For present purposes, the distinction between literal infringement and infringement under the doctrine of equivalents is largely irrelevant. However, one could argue that applying accession doctrine to limit injunctive relief is even more appropriate when an improver has not literally infringed a patent. For specific proposals to utilize liability rules in the context of infringement under the doctrine of equivalents, see Timothy R. Holbrook, \textit{Equivalency and Patent Law's Possession Paradox}, 24 \textit{Harv. J.L. & Tech.} 1, 46–48 (2009) and Smith, \textit{Intellectual Property}, \textit{supra} note 16, at 1818–19.

\textsuperscript{43} 717 F.2d 1351, 1353 (Fed. Cir. 1983).

\textsuperscript{44} \textit{Hughes}, 717 F.2d at 1354.

\textsuperscript{45} \textit{Id.} at 1366. As this case illustrates, the doctrine of equivalents can substantially expand the effective scope of a patent claim. Here, the accused device incorporated technological developments from outside of the original field of invention (and unforeseeable to the patentee), but it nonetheless infringed the underlying patent. Holbrook, \textit{supra} note 42, at 38.

\textsuperscript{46} For this and other reasons, Robert Merges and Richard Nelson argue in favor of narrow patents in fields marked by cumulative innovation. Merges & Nelson, \textit{supra} note 31, at 876–77. As discussed below, however, even narrow patents can read on a wide range of possible improvements, including those that operate in a radically different manner than the original patented invention. \textit{See infra} Section I.A. While acknowledging the problem of patent
Before proceeding, it is important to clarify the way in which this Article uses the term “improvement.” Although technological improvement represents one instantiation of cumulative innovation, this Article does not equate “improvement” with that broader term. Cumulative innovation may also encompass using one or more patented inventions as inputs into producing other inventions, such as when a scientist uses several patented gene fragments in research leading to a new biotechnology product. Cumulative innovation may also entail finding a new use for an existing patented invention, such as when an individual discovers that a patented leather tanning agent also treats AIDS. While both of these practices involve cumulative technological advances, they do not constitute “improvements” as this Article uses the term.

For present purposes, “improving” a patented invention entails creating a technology that serves a similar technical objective as the existing invention, but does so with greater efficiency or enhanced functionality. This Article focuses on a particular subset of technologies that both improve on some patented invention and infringe the underlying patent. One typical pattern for such improvement arises when a pioneer inventor patents some broad technological “genus” that is then infringed by a subsequent, improved “species” falling within that genus. In this sense, the subsequent party “designs over” an existing patented invention instead of “designing around” it. As should be clear, improvement does not necessarily entail consciously modifying some known, patented invention. A subsequent party

breadth, this Article directly addresses patent strength by arguing for liability-rule protection of patents that are infringed by substantially improved technologies.


may create a technological "improvement" of a prior patented invention without even being aware of that prior invention's existence.

A. The Framework in Theory

Mark Lemley offers a useful three-part structure for understanding patent law's treatment of technological improvements that this Article also adopts. First, "minor" improvements to a patented invention—notably improvements that do not satisfy the criteria for independent patentability—are largely dominated by the original patent. If the improvement infringes the patent, either literally or under the doctrine of equivalents, the pioneer patentee may bring suit, seeking an injunction and/or damages. Given that the improvement is not patented, the original patentee can freely practice it. In this sense, the original patentee essentially captures the value of the improver's efforts.

Second, the dynamic becomes more interesting in the case of "significant" improvements that are independently patentable over the original patented invention. Suppose, for example, that a pioneer inventor patented the original design of a manual toothbrush. Now, suppose a subsequent inventor develops an electric toothbrush—a significant improvement that fully incorporates the earlier patented invention. According to longstanding patent doctrine, the improver could patent her improved technology (assuming that it satisfied the statutory requirements of patentability) even though practicing it would constitute infringement of the earlier patent. This scenario reflects the familiar situation of "blocking patents." Generally, the pioneer patentee may prevent an improver from practicing any technology that encompasses the original patent (including the improvement), and the improver can prevent the original patentee from practicing the improvement. While overlapping exclusive rights seem like a perfect recipe for gridlock, they also encourage parties to negotiate a licensing agreement whereby one or both of the parties may practice the improved invention.

Third, under historical patent doctrine, "radical" improvements may completely avoid liability even though they literally infringe a patent. Under the so-called reverse doctrine of equivalents, an accused product may escape infringement liability if it is "so far changed in principle from a
patented article that it performs the same or a similar function in a substantially different way, but nevertheless falls within the literal words of the claim.\textsuperscript{57} In effect, the doctrine applies equitable principles to excuse radical improvements from infringement liability.\textsuperscript{58}

For example, in \textit{Boyden Power-Brake Co. v. Westinghouse}, Westinghouse accused Boyden of infringing its patent on an improved train brake.\textsuperscript{59} Westinghouse’s patented brake used both a central air reservoir as well as auxiliary air reservoirs in each train car to generate force for the brake cylinders, and it used a “triple valve” to coordinate air flow and pressure in each brake.\textsuperscript{60} Notably, Westinghouse’s brake also featured a separate “auxiliary valve” that could simultaneously direct air from \textit{both} the central and auxiliary reservoirs to the brake cylinders in case of emergency.\textsuperscript{61} Boyden’s allegedly infringing brake contained similar elements, including a triple valve. However, Boyden’s ingenious triple valve incorporated within it a valve that allowed air from both the central and auxiliary air reservoirs into a brake cylinder in case of emergency.\textsuperscript{62} Arguably, this element paralleled the separate “auxiliary valve” of Westinghouse’s brake, thus rendering Boyden’s brake a literal infringement of Westinghouse’s patent. However, noting the “manifest departure from the principle of the Westinghouse patent,”\textsuperscript{63} the Supreme Court denied liability under what is now understood as the reverse doctrine of equivalents. Even though Boyden’s improvement technically fell within Westinghouse’s claims, Boyden’s radically improved design avoided infringement.\textsuperscript{64} As a general matter, commentators have lauded the reverse doctrine of equivalents as maintaining incentives for inventors to improve radically on existing patented technologies.\textsuperscript{65}


\textsuperscript{58} Merges, \textit{Blocking Patents}, \textit{supra} note 56, at 91.

\textsuperscript{59} 170 U.S. 537 (1898).

\textsuperscript{60} \textit{Boyden}, 170 U.S. at 538.

\textsuperscript{61} \textit{Id.} at 541.

\textsuperscript{62} \textit{Id.} at 564–65.

\textsuperscript{63} \textit{Id.} at 572.

\textsuperscript{64} Cf. Scripps Clinic & Research Found. v. Genentech, Inc., 927 F.2d 1565 (Fed. Cir. 1991) (reversing the district court’s grant of summary judgment that a protein produced from recombinant DNA technology infringed a patent on the same protein obtained from purifying human blood).

\textsuperscript{65} See, e.g., Lemley, \textit{Economics of Improvement}, \textit{supra} note 31, at 1012–13; Merges, \textit{Blocking Patents}, \textit{supra} note 56.}
While commentators have praised this tripartite system for addressing technological improvement, practice does not always parallel theory. In cases of "significant" improvement, blocking patents encourage pioneer and subsequent patentees to negotiate a license. However, licensing transactions are fraught with difficulties. Challenges to licensing include the following: identifying pioneer patentees and improvers; high transaction costs; uncertainty regarding the scope and value of patents; the inability of contracting parties to capture positive externalities, which reduces incentives to license; and noneconomic motivations, such as spite and "bad blood." While several of these factors complicate licensing in general, they are intensified in negotiations between technological pioneers and improvers. For example, valuing the contributions of two different parties to an improved technology is highly difficult, and uncertainty over future technological developments can complicate negotiations.

Additionally, economic theory suggests that strategic bargaining will sometimes cause negotiations to fail even in the presence of a potential cooperative surplus. These considerations especially apply to bilateral monopolies in which there is only one seller and one buyer of a resource, which is often the case in patent licensing. While much academic commentary has focused on the implications of patent "holdup" for integrated products composed of many patented components, holdup may also apply to

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66. See Lemley, Economics of Improvement, supra note 31, at 1073–74 (suggesting that copyright law should adopt "blocking copyrights" and "radical improvers" doctrines modeled on analogous concepts in patent law).
67. Id. at 1048–61; see also Merges, Blocking Patents, supra note 56, at 89–91.
68. Merges, Blocking Patents, supra note 56, at 75.
69. See Kenneth J. Arrow, The Property Rights Doctrine and Demand Revelation under Incomplete Information, in Economics and Human Welfare 23 (M. Boskin ed., 1979), reprinted in 4 COLLECTED PAPERS OF KENNETH J. ARROW 216, 222–24 (1983); Robert Cooter & Steven Marks, Bargaining in the Shadow of the Law: A Testable Model of Strategic Behavior, 11 J. LEGAL STUD. 225, 243 (1982); Benjamin Klein, Transaction Cost Determinants of "Unfair" Contractual Arrangements, 70 AM. ECON. REV. (PAPERS & PROC.) 356 (1980), reprinted in READINGS IN THE ECONOMICS OF CONTRACT LAW 139 (Victor P. Goldberg ed., 1989); Benjamin Klein et al., Vertical Integration, Appropriable Rents, and the Competitive Contracting Process, 21 J.L. & ECON. 279, 298–300 (1978). Commentators have varied somewhat in delineating the particular costs that fall within the rubric of "transaction costs." See, e.g., Carol M. Rose, The Shadow of The Cathedral, 106 YALE L.J. 2175, 2184 (1997) (distinguishing Type I transaction costs, which relate to assembling large or indefinite groups of parties, from Type II transaction costs, which encompass the actual costs of bargaining, including strategic behavior). For purposes of emphasis, this Article will generally refer separately to transaction costs and strategic behavior, acknowledging full well that the latter may be regarded as a subset of the former.
licensing negotiations for single-component products. As Robert Merges and Richard Nelson tellingly describe, “The owner of an improvement that contributes a very significant part of the value of the ‘original patent plus improvement’ combination—i.e., an improvement that represents a major technical advance—is thus subject to ‘holdup’ by the original patent holder.”

To be sure, Lemley argues that blocking patents ameliorate these concerns, “not by reducing transaction costs or uncertainty, but by increasing the value to both parties of coming to an agreement.” Ultimately, however, because of lingering transactional and strategic difficulties, bargaining between pioneers and improvers “will occasionally break down even though they could both realize substantial gains from agreement.” Empirical accounts of the early radio and steel industries confirm that negotiations between pioneers and improvers sometimes fail and suggest that these failures can cause high social welfare losses.

In addition, it is important to consider not only whether parties agree to a license but the particular division of rents arising from their agreement. If an original patentee leverages her right to exclude to extract a disproportionate share of rents, then even though a licensing agreement is achieved, an improving patentee might face excessively diminished incentives to invent. Ultimately, such chilled incentives may discourage future efforts to improve on existing patented inventions.

Turning to “radical” improvements, courts rarely invoke the reverse doctrine of equivalents. In theory, the doctrine “serves as a judicial ‘safety valve’” that can ameliorate instances of bargaining breakdown between pioneers and improvers. However, the Federal Circuit has effectively abrogated the doctrine. In 2002, it stated as follows:

Not once has this court affirmed a decision finding noninfringement based on the reverse doctrine of equivalents. And with good reason: when Congress enacted 35 U.S.C. § 112, after the decision in Graver Tank, it imposed requirements for the written description, enablement, definiteness,

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73. Lemley, Economics of Improvement, supra note 31, at 1069.
74. Merges, Blocking Patents, supra note 56, at 75.
75. Id. at 84–89.
76. Id. at 75. While Robert Merges advocates excusing some holders of subservient blocking patents from infringement liability, most notably via the reverse doctrine of equivalents, I propose a more graduated approach in which such parties would face liability-rule protection of the patents they infringe. See id. at 75–76; Merges, Property Rules, supra note 50, at 2660.
and means-plus-function claims that are co-extensive with the broadest possible reach of the reverse doctrine of equivalents.\textsuperscript{78} According to the Federal Circuit, the disclosure and claiming requirements of patent law constrain claim scope such that radical improvements are likely to avoid infringement liability, thus rendering the reverse doctrine of equivalents somewhat superfluous. However, given the vagueness of claims and the breadth with which courts often interpret them,\textsuperscript{79} it seems doubtful that these "constraints" provide the same safeguard as the reverse doctrine of equivalents. In any event, as an empirical matter the doctrine is "seldom-used" and largely moribund.\textsuperscript{80}

In sum, the patent system often operates in practice to favor original patentees considerably over subsequent improvers. "Minor" improvements are dominated by prior patents. "Significant" improvers, although wielding the leverage of their own patents, face difficult negotiations with pioneer patentees. And "radical" improvers may rarely avail themselves of the reverse doctrine of equivalents to escape infringement liability. In many ways, improvers are still subject to the exclusive rights of pioneer patentees, thus dampening incentives to improve. To further shore up these incentives, and to provide a more equitable approach to technological improvement, this Article turns to doctrines from traditional property law.

II. PATENTS AS PROPERTY

A. Exclusive Rights over Productive Resources

As illustrated in the previous survey of technological improvement, the patent system generally confers strong exclusive rights over inventions. Pioneer patentees dominate minor improvers, and such patentees also enjoy a high degree of leverage over significant improvers in blocking patents scenarios. The reverse doctrine of equivalents is the exception that proves the rule; courts apply this limitation on a patentee's strict right to exclude extremely rarely.

\textsuperscript{78} Tate Access Floors, Inc. v. Interface Architectural Res., Inc., 279 F.3d 1357, 1368 (Fed. Cir. 2002).


\textsuperscript{80} Merges, Blocking Patents, supra note 56, at 91; see also Roche Palo Alto LLC v. Apotex, Inc., 531 F.3d 1372, 1378 (Fed. Cir. 2008) ("The reverse doctrine of equivalents is rarely applied, and this court has never affirmed a finding of non-infringement under the reverse doctrine of equivalents."); Ethyl Molded Prods. Co. v. Betts Package Inc., Civ. A. No. 85-111, 1988 WL 122168, at *36 (E.D. Ky. 1988) ("The reverse doctrine of equivalents, although frequently argued by infringers, has never been applied by the Federal Circuit.").
In embracing strong exclusive rights, patent law clearly parallels the law of physical property. Property, after all, has long been associated with the right to exclude. This Article further explores the similarities of patents and physical property, but in a manner that leads to some rather unexpected results. In so doing, it must proceed cautiously, for patent law has a complicated relationship with property. On the one hand, patents and property share certain unmistakable similarities in both ends and means. In terms of objectives, patent law’s goal of promoting technological progress parallels one of the most important objectives of property rights: to encourage productive exploitation of resources. In terms of mechanisms, patent law parallels traditional formulations of property rights by conferring broad exclusive rights over such resources. Exclusive rights serve a number of functions in both contexts, including facilitating the internalization of externalities and economizing on information costs when delineating acceptable uses of assets.

Along these lines, numerous authorities have long compared patents to physical property. This comparison is unsurprising given that the Patent Act itself states that “patents shall have the attributes of personal property.” The Supreme Court has noted that “[p]atents... have long been considered a species of property and has described patent rights as encompassing “the legitimate expectations of inventors in their property.” Furthermore,

81. See Coll. Sav. Bank v. Fla. Prepaid Postsecondary Educ. Expense Bd., 527 U.S. 666, 673 (1999) (“The hallmark of a protected property interest is a right to exclude others.”); Kaiser Aetna v. United States, 444 U.S. 164, 176 (1979) (noting that the right to exclude is “one the most essential sticks in the bundle of rights that are commonly characterized as property”); 2 WILLIAM BLACKSTONE, supra note 18, at *2 (describing property ownership as “that sole and despotic dominion which one man claims and exercises over the external things in the world, in total exclusion of the right of any other individual in the universe”); Richard Epstein, Takings, Exclusivity and Speech: The Legacy of PruneYard v. Robins, 64 U. CHI. L. REV. 21, 22 (1997) (“It is difficult to conceive of any property as private if the right to exclude is rejected.”); Thomas W. Merrill, Property and the Right to Exclude, 77 NEB. L. REV. 730, 730 (1998) (“The right to exclude others is more than just ‘one of the most essential constituents’ of property—it is the sine qua non.” (quoting Kaiser Aetna, 444 U.S. at 176)).

82. See, e.g., Harold Demsetz, Toward a Theory of Property Rights, 57 AM. ECON. REV. 347 (1967). This productive impulse is reflected, for example, in the doctrine of first possession. See, e.g., CAROL M. ROSE, PROPERTY AND PERSUASION 20 (1994). This is not, of course, the only purpose that property rights serve. See JESSE DUKEMINIER ET AL., PROPERTY 50-52 (7th ed. 2010) (listing other objectives of property law).

83. See 35 U.S.C. § 271(a) (2006) (“[W]hoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent.”).


academic commentary is replete with comparisons of patents to physical property.89

In most contexts, this conception of patents as property bolsters normative claims that patents should confer strict exclusive rights.90 Just as trespass grants landowners a strong right to exclude unauthorized visitors,91 patents should enable inventors to enjoin all unauthorized uses of a patented technology. According to this view, strict exclusive rights provide the best mechanism for encouraging invention and commercialization,92 facilitating technology transactions,93 and minimizing the information costs of using technologies.94

On the other hand, scholars have questioned the patents-as-property analogy by highlighting the fundamentally different natures of patented inventions and physical property. The technical information protected by patents is a public good, meaning that it is nonrival95 (multiple parties can use it without diminishing its availability) and nonexcludable96 (absent legal

Stablin Bros. Fibre Works, 575 F.2d 1152, 1158 n.5 (6th Cir. 1978) ("Patents must by law be given 'the attributes of personal property.' The right to exclude others is the essence of the human right called 'property.'" (citations omitted) (quoting 35 U.S.C. § 261)). Historically, some courts have even extended the Takings Clause to government deprivations of patent rights. Adam Mossoff, Patents as Constitutional Private Property: The Historical Protection of Patents Under the Takings Clause, 87 B.U. L. Rev. 689, 690 (2007) ("Patents are property."). But see Zoltek Corp. v. United States, 442 F.3d 1345 (Fed. Cir. 2006) (per curiam) (refusing to apply the Takings Clause to government deprivations of patents).


90. E.g., Lemley, Free Riding, supra note 89, at 1031–32 (describing but not endorsing this argument); Mark A. Lemley & Phillip J. Weiser, Should Property or Liability Rules Govern Information?, 85 Tex. L. Rev. 783, 783–84 (2007) (same).

91. Tellingly, even here property law admits some exceptions. See infra note 110 and accompanying text.

92. E.g., Kieff, supra note 89, at 733 (noting the importance of strict exclusive rights in commercializing technology).


95. See Letter from Thomas Jefferson to Isaac M’Pherson (Aug. 13, 1813), in 6 THE WRITINGS OF THOMAS JEFFERSON 180–81 (H.A. Washington ed., N.Y.C., Derby & Jackson 1859) (describing ideas as "expansible over all space, without lessening their density in any point").

96. While firms may protect valuable information as trade secrets, without legal intervention such as enforceable nondisclosure agreements, it may be difficult for firms to maintain the secrecy of information yet still exploit it.
intervention, it is difficult if not impossible to exclude others from appropriating it). These attributes distinguish intellectual property from physical property such as land and chattels, which are both rivalrous and more easily excludable. As such, traditional justifications for private property rights, such as to avoid a tragedy of the commons, are inapposite to intellectual property, which by its nature is not subject to overconsumption. The theoretical foundations for patents and property are thus quite distinct. Furthermore, natural rights justifications for property law do not apply with the same force to patents, which (according to conventional understanding) exist not to reward effort or genius but to promote society-wide technological progress. Commentators also observe that the term "intellectual property" is of relatively recent vintage and that this linguistic similarity may imply more conceptual similarity than is warranted.

These distinctions between patents and property, moreover, motivate calls to limit the breadth and strength of patent rights. Viewed through an economic lens, the nonrival nature of technical designs means that an infinite number of people can simultaneously "consume" them without producing scarcity. Static allocative efficiency thus weighs in favor of open

97. But see Robin Cowan et al., The Explicit Economics of Knowledge Codification and Tacitness, 9 INDUS. & CORP. CHANGE 211, 224 (2000) (noting the importance of tacit knowledge in practicing patented inventions and challenging the conception of knowledge as nonrival and nonexcludable).
98. Lemley, Free Riding, supra note 89, at 1050–53.
99. Garrett Hardin, The Tragedy of the Commons, 162 SCI. 1243, 1245 (1968); see Demsetz, supra note 82, at 348–49 (framing this argument in terms of internalizing externalities).
100. Lemley, Free Riding, supra note 89, at 1053; see also Mossoff, supra note 88, at 719–21 (noting the challenge of applying the Takings Clause to patent law, given that government use of a patented invention does not physically dispossess the inventor of anything). But see Robert P. Merges et al., Intellectual Property in the New Technological Age 1035 (5th ed. 2010) (noting "congestion externalities" that undermine the value of intangible resources—such as a celebrity's image—even though the underlying resource remains nonrival).
101. Lemley, Free Riding, supra note 89, at 1055 ("Intellectual property . . . is not a response to allocative distortions resulting from scarcity, as real property is. Rather, it is a conscious decision to create scarcity in a type of good which is ordinarily absent in order to artificially boost the economic returns to innovation." (emphasis omitted)).
104. See Lemley, Free Riding, supra note 89, at 1033 n.4; cf. Lemley & Weiser, supra note 90, at 783–84 (describing the different origins and rationales of property law and intellectual property law).
access to existing inventions, a regime that cuts directly against exclusive rights. While physical property law utilizes exclusive rights to internalize externalities, commentators note that full internalization of externalities would be highly deleterious in the intellectual property context. Indeed, positive externalities are crucial to the design of intellectual property regimes, which allow and encourage many forms of free riding.

This Article does not attempt to resolve the question of whether patents are property. Rather than accept or reject the patents-as-property analogy wholesale, this Article takes a more granular approach. It contends that in certain contexts, property doctrine and theory may be helpful in understanding, tailoring, and improving certain aspects of patent law. Continuing with the theme of granularity, this Article also challenges the implicit presumption that physical property law categorically favors strict exclusive rights. At a descriptive level, “[t]he very notion of property as exclusive dominion is at most a cartoon or trope.” In various contexts, property law limits an owner’s right to exclude to serve interests of efficiency, fairness, and public welfare. At a normative level, the ways in which property law confers less than strict exclusive rights may suggest curtailing patent rights as well.

Before introducing a specific proposal applying these insights, this Article turns to a recent Supreme Court case that sheds additional light on the nature of property rights conferred by patents.

106. See Demsetz, supra note 82.
107. See, e.g., Brett M. Frischmann & Mark A. Lemley, Spillovers, 107 Colum. L. Rev. 257 (2007); Lemley, Free Riding, supra note 89.
108. See Frischmann & Lemley, supra note 107.
B. eBay v. MercExchange

An important Supreme Court case dealing with patent infringement remedies has further complicated the relationship between patents and property. In eBay Inc. v. MercExchange, L.L.C., eBay and Half.com, a wholly owned subsidiary of eBay, infringed MercExchange's business method patent on an electronic market. However, the district court denied MercExchange's motion for permanent injunctive relief. The Federal Circuit reversed, applying its "'general rule that courts will issue permanent injunctions against patent infringement absent exceptional circumstances.'" On appeal, the Supreme Court reversed the Federal Circuit. The Court first affirmed a conception of patents as property but then clarified that "the creation of a [property] right is distinct from the provision of remedies for violations of that right." Thus, the Court implicitly acknowledged that protecting a property right did not necessarily require a property rule, which is characterized by injunctive relief.

The Court thus rejected a per se rule favoring injunctions in infringement actions and established a multifactor equitable framework for determining the appropriateness of injunctive relief. The Court described this framework as follows:

A plaintiff must demonstrate: (1) that it has suffered an irreparable injury; (2) that remedies available at law, such as monetary damages, are inadequate to compensate for that injury; (3) that, considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted; and (4) that the public interest would not be disserved by a permanent injunction.

eBay has significant implications for the relationship between patents and property. It also has significant implications for infringement remedies in the context of technological improvement. Courts are no longer shackled

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113. Id. at 715.
115. Id. at 392.
117. eBay, 547 U.S. at 391. In adopting a holistic framework, the Court thus reinvigorated the equitable nature of patent injunctions analysis. See 35 U.S.C. § 283 (2006) ("The several courts having jurisdiction of cases under this title may grant injunctions in accordance with the principles of equity to prevent the violation of any right secured by patent, on such terms as the court deems reasonable."); Wendy R. Stein, The Supreme Court's eBay Decision: Eliminating Special Rules in Patent Cases, INTELL. PROP. TODAY, Oct. 2006, at 18.
118. eBay, 547 U.S. at 391.
to a syllogism wherein a finding of infringement leads inexorably to the
grant of an injunction, thus raising the possibility of continued infringement
even after a finding of liability. Denying injunctive relief also raises the pos-
sibility of providing ongoing royalties to a patentee as compensation for
prospective infringement, thus converting patent protection from a property
rule to a liability rule.\textsuperscript{119} In order to apply this newfound flexibility to en-
hance patent law's treatment of technological improvement, this Article first
turns to the physical property principle of accession.

III. Accession

A. Accession Generally

In general, the principle of accession refers to the granting of title to some
resource based on its relationship to something that is already owned.\textsuperscript{120} Ac-
cession, which enjoys a long history extending from Roman civil law,\textsuperscript{121}
encompasses several distinct legal doctrines sharing this conceptual basis. Under the doctrine of ratione soli, for example, landowners enjoy constructive
possession of wild animals that happen to be on their land.\textsuperscript{122} Similarly, the
“rule of increase” holds that the owner of a female domesticated animal also
owns whatever offspring that animal produces.\textsuperscript{123} Likewise, under the doctrine
of accretion, a riparian landowner takes title to alluvial deposits that augment
her land.\textsuperscript{124} Accession further explains why farmers own the crops that grow
on their soil,\textsuperscript{125} property owners hold title to oil deposits beneath their surface
estates,\textsuperscript{126} and fixtures generally belong to the owner of the land and im-
provements to which they are affixed.\textsuperscript{127} In all of these cases, accession grants
title to property based on its relationship to something that is already owned.

This Article focuses on a subset of accession doctrines dealing with one
party’s improvement of someone else’s property. Here, again, distinctions are
in order. In the real property context, typical cases involve a trespasser who,
perhaps mistakenly, improves someone else’s land by building a house on it.\textsuperscript{128} This Article, however, focuses on a constellation of “mistaken improver”

\begin{itemize}
\item 119. See Calabresi & Melamed, supra note 12, at 1092–93.
\item 120. See Merrill, supra note 16, at 460.
\item 121. See Wetherbee v. Green, 22 Mich. 311, 313 (1871); Silsbury v. McCoon, 3 N.Y.
379, 388 (1850); Earl C. Arnold, The Law of Accession of Personal Property, 22 COLUM.
L. REV. 103 (1922); Merrill, supra note 16, at 463.
\item 122. See Pierson v. Post, 3 Cai. 175, 179–80 (N.Y. Sup. Ct. 1805) (discussing ratione
soli).
\item 123. Merrill, supra note 16, at 464–65.
\item 124. Id. at 465–66; cf. Nebraska v. Iowa, 143 U.S. 359 (1892) (holding that the law of
accretion controls when the river boundary between two states shifts).
\item 125. Merrill, supra note 16, at 465.
\item 126. Id. at 467.
\item 127. Id.
Abraham Bell & Gideon Parchomovsky, A Theory of Property, 90 CORNELL L. REV. 531,
doctrines dealing with personal property. Given the Patent Act’s characterization of patents as "personal property," this focus seems particularly appropriate.

Commentators routinely group several related but distinct concepts together when discussing mistaken improvers of personal property. Such grouping is all the more confusing because one of these concepts is known as "accession." First, "specification" applies when someone exerts labor or skill to create a new product out of the personal property of another, such as when one person uses someone else’s marble to carve a statue. Second, "accession" or "adjunction" applies when two or more items of personal property owned by different parties are joined but remain distinguishable. This concept is implicated, for example, when one individual’s diamond is encased in another individual’s ring. Finally, "confusion" applies when two similar kinds of property (from different owners) are combined such that they cannot be distinguished. This occurs, for example, when wheat belonging to two different owners becomes intermixed. In common parlance, the doctrine of accession has come to be associated with both the concepts of "specification" and "accession," which are distinct from "confusion." While this Article focuses most centrally on the concept of "specification," it refers to the broader doctrine of accession consistent with modern usage.

In certain circumstances, the doctrine of accession can cause a curious transfer of property rights. According to this doctrine, when an innocent party improves someone else’s personal property in a way that significantly enhances its value or changes its nature, the improver may take title to the improved item, contingent upon compensating the original owner for the raw materials. In explaining this application of accession, Blackstone noted:


130. See generally Arnold, supra note 121 (distinguishing among specificatio, accessio, and confusion).

131. Id. at 104–17.

132. Id. at 118.


135. Merrill, supra note 16, at 464 n.4; see also Newman, Patent Infringement, supra note 17, at 87.

136. 2 William Blackstone, supra note 18, at *404–07; see Arnold, supra note 121, at 120 ("In the absence of a statutory modification of the common law action of replevin, the plaintiff cannot recover his property in specie if its personal identity has been changed."); see, e.g., B.A. Ballou & Co. v. Citytrust, 591 A.2d 126, 130 n.4 (Conn. 1991) ("If, however, the identity of the item has been destroyed, its nature substantially changed, or value greatly enhanced, as between the manufacturer and the original owner, the owner loses his right of
If the thing itself, by such operation, was changed into a different species, as by making wine, oil, or bread, out of another's grapes, olives, or wheat, it belongs to the new operator; who has only to make a satisfaction to the former proprietor for the materials, which he had so converted.\footnote{137}{2 William Blackstone, supra note 18, at *404.}

The canonical case of \textit{Wetherbee v. Green}, discussed above,\footnote{138}{See supra notes 1–5 and accompanying text.} illustrates the doctrine of accession.\footnote{139}{22 Mich. 311 (1871).} Wetherbee, acting in good faith,\footnote{140}{The property at issue was originally owned by Sumner and Green as tenants in common. Wetherbee obtained a license from Sumner, who had been authorized by Green to grant licenses on behalf of both co-owners. However, before Sumner granted a license to Wetherbee, Sumner had conveyed his interest to Camp and Brooks. Thus, at the time that Sumner issued the license to Wetherbee, Sumner had no interest in the property. \textit{Wetherbee}, 22 Mich. at 312–13.} cut a stand of trees and used the resulting lumber to fashion barrel hoops, thus increasing the value of the wood more than twentyfold.\footnote{141}{Id. at 313.} The original property owners sued for replevin of the hoops. After reciting the general rule that one whose property has been misappropriated may recover it,\footnote{142}{Id. at 314; accord Silsbury v. McCoon, 3 N.Y. 379, 381–85 (1850); Arnold, supra note 121, at 104.} the Supreme Court of Michigan identified an exception based on accession.\footnote{143}{Drawing in particular on the notion of specification, the court observed that there must "be some limit to the [property owner's] right to follow and reclaim materials which have undergone a process of manufacture." \textit{Wetherbee}, 22 Mich. at 315.} Where an individual has transformed someone else's property, thus significantly enhancing its value, title shifts to the improver as long as he compensates the original owner for the materials taken:\footnote{144}{Id.}
In a case of this kind, the change in the species of the chattel is not an intentional wrong to the original owner. It is, therefore, regarded as destruction or consumption of the original materials, and the true owner is not permitted to trace the identity into the manufactured article, for the purposes of appropriating to his own use the labor and skill of the innocent occupant who wrought the change.\textsuperscript{145}

Extrapolating from these principles, Wetherbee could retain title to the improved property contingent upon paying damages to the original owners for the underlying wood.

To determine whether accession warrants shifting title from plaintiff to defendant, courts focus on the degree to which a defendant has “transformed” the property in question.\textsuperscript{146} Courts have developed several approaches to evaluating transformation. First, courts applying “physical identity theory” consider whether an improved article has “changed into another species.”\textsuperscript{147} Within this approach, “a permanent alteration of the component parts must have been made, so that any attempt to change them again to their original form would cause so much damage in proportion to the value as to make it impracticable.”\textsuperscript{148} Notably, in some cases, this approach can transfer title from an original owner to an improver even when the taking was willful.\textsuperscript{149} Second, many courts focus on the “comparative value” of the original and improved items to determine whether the improvement has produced the requisite transformation.\textsuperscript{150} This approach is generally only available when the original taking was not willful.\textsuperscript{151}

\textit{Wetherbee} is indicative of the comparative value approach,\textsuperscript{152} which several modern courts have also adopted.\textsuperscript{153} If the value of the improver’s labor “has swallowed up and rendered insignificant the value of the original materials,” transformation has been achieved and title transfers to the improver.\textsuperscript{154}

\begin{itemize}
\item \textsuperscript{145} \textit{Id.} at 316.
\item \textsuperscript{146} \textit{Id.} at 318 (“The important question . . . appears to us to be, whether standing trees, when cut and manufactured into hoops, are to be regarded as so far changed in character that their identity can be said to be destroyed within the meaning of the authorities.”); see also \textit{Silsbury}, 3 N.Y. at 385–87 (giving examples involving transformations of wheat to bread, olives to oil, and grapes to wine). Of course, transformation is not the only factor that courts consider. For example, several courts have held that no matter what the degree of physical transformation, if a defendant has engaged in willful trespass, the original owner may recover an improved article derived from his property. Arnold, \textit{supra} note 121, at 107.
\item \textsuperscript{147} \textit{Id.} at 105.
\item \textsuperscript{148} \textit{Id.}
\item \textsuperscript{149} \textit{Id.} at 108.
\item \textsuperscript{150} \textit{Id.} at 106.
\item \textsuperscript{151} \textit{Id.}
\item \textsuperscript{152} Wetherbee v. Green, 22 Mich. 311, 320 (1871) (“When the right to the improved article is the point in issue, the question, how much property or labor of each has contributed to make it what it is, must always be of first importance.”).
\item \textsuperscript{154} \textit{Wetherbee}, 22 Mich. at 320.
\end{itemize}
Within this analysis, courts focus on the actual values of the improver’s and original owner’s contributions to the improved item, not on the cost of their respective contributions. Whichever party contributes the greater part of the value takes title to the improved item.

Here it is important to clarify a potential point of confusion regarding accession doctrine. As previously noted, the principle of accession grants title to some asset based on its relationship to something else that is already owned. In cases of mistaken improvement, this principle may suggest that the original owner should retain title to the improved item. (After all, the improved item is derived from resources that are already owned by that party.) However, the doctrine of accession shifts title to the improver in cases of transformative or significant, value-enhancing improvement. While this doctrine appears to be an exception to the general accession principle, it is in fact consistent with it. Abstracting somewhat, Thomas Merrill observes that the central question in accession cases is “which owner of inputs has supplied the larger or more valuable input—i.e., has established the most prominent connection” to the improved item. The operative “input” in cases of value-enhancing improvement is the labor of the improver. This labor establishes a more “prominent connection” to the improved item, thus trumping the other party’s original ownership of the source material. The “mistaken improver” doctrine thus represents a coherent application of general accession principles by allocating title to property based on its relationship to something else that is owned—namely, the labor of the improver.

Commentators have lauded accession on a number of fronts. Information costs are critical to property, and accession provides a low-cost, intuitive method for allocating property rights in an improved item. By vesting title in the improver, the doctrine of accession thus encourages (or at least does not unduly punish) productive exploitation of resources. However, the doctrine guards against strategic behavior by generally insisting on good faith by the mistaken improver. The doctrine of accession also appeals to notions of fairness. There is, as commentators have pointed out, a distinctly Lockean tenor to accession doctrine, which converts protection of a resource from a property rule to a liability rule based on an innocent improver’s significant and value-enhancing contributions to some source material. The doctrine parallels Locke’s notion that an improving laborer should receive

155. See, e.g., id. (concluding that “[n]o test which satisfies the reason of the law” can ignore “the circumstance of relative values”).
156. Merrill, supra note 16, at 466.
157. Id. at 481 n.16.
159. Merrill, supra note 16, at 477–78.
As we will see, these benefits—notably efficiency and fairness—provide valuable guides for reforming the treatment of technological improvement in patent law.

B. Accession and Intellectual Property

Before turning to the proposal at hand, it is worthwhile to note that many areas of intellectual property law already exhibit accession-like features. Where accession arises in the intellectual property context, it generally operates to expand the scope of exclusive rights for existing owners of intellectual property assets. As noted below, however, this need not be the case.

For example, one sees traces of accession in copyright law. This is most apparent in copyright's provisions that award "derivative work" rights to an initial author. Under standard copyright doctrine, an author who writes a book about a boy wizard who attends wizard school obtains not only exclusive rights in that written work, but also the right to prepare "derivative works" such as sequels and movie adaptations. Here, ownership of some resource (the derivative work) is allocated to the initial author based on the work's relationship to something else that is already owned (the copyright in the book).

Trademark law also reflects principles of accession, most notably in the doctrine of dilution. Dilution gives the owner of a famous mark the right to prohibit uses of the mark that may blur or tarnish it, even where consumer confusion is unlikely. For example, dilution would likely prohibit a firm from calling its product "Rolls Royce Corndogs," even though few consumers would be confused into thinking that the famous automaker produces this snack food. Dilution reflects accession principles insofar as trademark law confers "supplementary" property rights to an individual based on the close relationship between those rights and a presently owned, famous mark.

Commentators have also identified elements of accession in patent law. Henry Smith draws an analogy between accession and the original grant of a patent to an inventor. According to this view, technical ideas are collected...
tively owned in the public domain, and inventors add their ingenuity and labor to these ideas to produce privately owned, patented inventions.\textsuperscript{168} This interaction parallels accession scenarios in which one party improves someone else’s property. Under this formulation, the inventor receives title to the “improvement” (the patented invention) in exchange for compensating the public via technical disclosure.\textsuperscript{169}

Elements of accession are reflected not only in the initial grant of patent rights but also in the broad control that patentees enjoy over subsequent technological developments. Related to the cases of “minor” and “significant” improvements described above,\textsuperscript{170} Thomas Merrill sees accession at play in allowing pioneer patentees to enjoy property rights over subsequent technological advances.\textsuperscript{171} In particular, minor improvements to a patented invention that are not themselves independently patentable effectively belong to the pioneer inventor, as she can “block anyone else from using an invention that incorporates the patent.”\textsuperscript{172} This view also relates to Edmund Kitch’s influential prospect theory, which justifies granting early, broad patents to inventors based on the notion that patentees may then rationally coordinate subsequent developments of protected technologies.\textsuperscript{173} An even more direct example of accession is the doctrine of equivalents, which effectively enhances patent scope beyond what an inventor literally claims.\textsuperscript{174} Here, again, patent law allocates ownership of additional resources based on their relationship to something that is already owned—in this case an existing patented invention.

While accession generally serves to expand (or initiate) the rights of patentees, it may also limit those rights.\textsuperscript{175} As a broad normative matter, Mark Lemley and Mark McKenna challenge an expansive notion of accession on the ground that it jeopardizes the public domain, a valuable “residuum” where “ideas and creations remain unowned, free for all to use.”\textsuperscript{176} As a doctrinal matter, however, it is not always the case that accession favors the

\begin{itemize}
  \item 168. Among other considerations, Smith distinguishes patent acquisition from first possession, which presumes that the underlying technical ideas are unowned, by emphasizing that society has preexisting rights in the public domain. \textit{Id.} at 1767–68.
  \item 169. \textit{Id.} at 1771.
  \item 170. \textit{See supra} Part I.
  \item 171. Merrill, \textit{supra} note 16, at 468–69.
  \item 172. \textit{Id.} at 469.
  \item 174. Merrill, \textit{supra} note 16, at 469; \textit{see} Autogiro Co. of Am. v. United States, 384 F.2d 391, 400 (Ct. Cl. 1967).
  \item 175. In a proposal similar to the one advanced below, Gideon Parchomovsky and Alex Stein have suggested various mechanisms for limiting a copyright holder’s right to exclude based on the degree of originality of an infringing work. Parchomovsky & Stein, \textit{supra} note 16. Notably, the authors draw support for their proposal from accession doctrine. \textit{Id.} at 1327.
  \item 176. Lemley & McKenna, \textit{supra} note 166, at 177–80. While Lemley and McKenna criticize accession in the context of trademark law, \textit{id.}, their arguments are also applicable to other branches of intellectual property, including patent law.
\end{itemize}
interests of original resource owners. This is particularly relevant when two inventors both have claims on some technology, such as when one party improves on another's invention.

In an insightful article, Christopher Newman explores the possibility of applying accession doctrine to limit injunctive relief when a substantial improver infringes an underlying patent. While he notes the viability of such a proposal, concerns over valuation and pricing lead him to suggest cabining its application to somewhat limited contexts. Among other considerations, he argues that the thinness of licensing markets and concomitant valuation difficulties preclude widespread application of accession doctrine to limit injunctive relief. Even where reliable valuations are feasible, the risk of opportunistic behavior complicates potential applications of accession. Even where reliable valuations are feasible, the risk of opportunistic behavior complicates potential applications of accession. Along these lines, he argues that injunctive relief should be denied only when an initial patentee has already nonexclusively licensed his patent or where enhanced damages based on willful infringement are available to encourage negotiations between a pioneer patentee and an improver.

While I share many of Newman's concerns, I offer a more optimistic account of applying accession to cases of infringing technological improvement. In particular, this Article draws on recent developments in the law of patent infringement remedies—including both injunctions and damages—to show that technical concerns are less vexing than first meets the eye. Additionally, I frame my proposal for liability-rule protection of pioneer patents as an action-forcing mechanism that may actually encourage more voluntary negotiations between improvers and pioneer patentees. Accordingly, I contend that accession offers a valuable guide for reforming the law of technological improvement.

IV. APPLYING ACCESSION DOCTRINE TO PATENT INFRINGEMENT REMEDIES

A. The Proposal

This Article proposes that courts apply accession analysis within the eBay framework to deny injunctive relief in cases where an infringer "substantially" improves on an underlying patented invention. If a court applies accession and denies an injunction, it would then direct the pioneer and

177. Newman, Patent Infringement, supra note 17. Newman largely focuses on the canonical case of "improvements" involving a multicomponent system that incorporates and infringes some underlying patent. Id. at 67. This Article, however, focuses on situations approximating the reverse doctrine of equivalents, where a technology infringes an existing patent but achieves a similar technical objective in a substantially improved manner.

178. Id. at 114–15.

179. Id. at 115–16.

180. Id. at 69.

improver to negotiate an ongoing royalty to compensate for prospective infringement. If such negotiations failed, the court would determine and impose a royalty on the defendant.\footnote{While determining ongoing royalties for \textit{prospective} infringement differs in certain respects from determining reasonable royalties for \textit{past} infringement, see infra Sections IV.A.4, V.B.2, the statute governing the latter can help guide determinations of the former. See 35 U.S.C. § 284 (2006) ("Upon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court."). In general, this Article will use "ongoing" royalty to refer to compensation for prospective infringement and "reasonable" royalty to refer to compensation for past infringement.} Similar to traditional property doctrine, accession in the patent realm would convert patent protection to a liability rule in the context of substantially improving infringement.\footnote{Borrowing Henry Smith’s terminology, this proposal would convert patent protection from an exclusion regime to a governance regime. See Henry E. Smith, \textit{Exclusion Versus Governance: Two Strategies for Delineating Property Rights}, 31 J. LEGAL STUD. S453 (2002); Smith, \textit{Property and Property Rules}, supra note 84, at 1728. Whereas exclusion regimes, as the name implies, rest on a fairly categorical right to exclude, governance regimes provide selective, use-specific access to a resource. A principal difficulty of governance regimes involves identifying the particular uses that qualify for access, which would translate under this proposal to identifying "substantially" improving infringements that qualify for the accession rule. As discussed below, however, \textit{eBay} and its progeny already encourage courts to weigh the relative contributions of various sources to a technology, thus providing conceptual guidance for identifying "substantial" technological improvements. See infra Section IV.B.} Such an approach would ameliorate current limitations in patent law’s treatment of technological improvement and would accelerate the introduction of improved technologies to the marketplace.\footnote{Under this proposal, accession would be available for substantially improved technologies found to infringe either literally or under the doctrine of equivalents. However, given the tendency of the doctrine of equivalents both to expand patent scope and to render it more difficult to ascertain, fairness considerations may render liability-rule protection particularly appropriate in situations of nonliteral infringement. \textit{Cf.} Holbrook, supra note 42, at 46–48 (suggesting liability-rule protection of patents when infringed under the doctrine of equivalents); Smith, \textit{Intellectual Property}, supra note 16, at 1818–19 (same).}

Having outlined the proposal in broad strokes, the challenge, of course, lies in fleshing out the details. In particular, potential application of accession hinges considerably on whether an infringing technology embodies a "substantial" improvement, a difficult concept to define. In general, the objectives and risks of adapting accession to patent law should provide a functional guide to defining the substantial improvement criterion.\footnote{Furthermore, this criterion is best understood within the context of the \textit{eBay} framework, as the "substantiality" of an improvement may bear on each of the four factors informing the appropriateness of injunctive relief. See infra Section IV.A.2. For example, if an infringing technology substantially improves on some underlying patent, the public interest in allowing continued infringement may be very high.} In the patent context, accession aims to promote efficiency and fairness where a high-value, improved technology is subject to holdup by a lower-value patent. However, liability-rule protection of patents comes at a cost because...
such regimes are expensive to administer and may undercompensate patentees.\textsuperscript{186} Furthermore, such regimes may spur strategic behavior whereby a party trivially improves on an existing invention and then raises the threat of liability-rule protection in negotiations with a patentee. All of these considerations counsel in favor of a high standard for "substantial" improvement both to ensure that the benefits of liability-rule protection are cost-justified and to discipline strategic assertions of accession by infringers.

Under this proposal, identification of a "substantial" improvement would involve a gestalt assessment encompassing both technical and economic considerations.\textsuperscript{187} Drawing on analogous concepts from physical property accession, substantial improvement would be most evident where an infringing technology "transforms" a patented invention rather than simply modifies it incrementally. Here, the qualitative analysis of the reverse doctrine of equivalents—which relieves liability for literally infringing technologies that operate in a "substantially different" manner from a patented invention—can help identify substantial improvements.\textsuperscript{188} Additionally, courts may adapt familiar principles of nonobviousness analysis to help identify substantial improvements.\textsuperscript{189} Within this framework, a notably strong showing of nonobviousness on the part of an infringing technology may indicate substantial technological improvement over an existing patented invention. (Although courts do not generally examine the nonobviousness of accused inventions, such analysis may be especially appropriate if in fact the accused technology is patented, as in the case of blocking patents.) In particular, the technically oriented secondary considerations of nonobviousness—such as satisfaction of long-felt needs, failure of others, initial skepticism by experts, praise by technical artisans, teaching away in the prior art, and copying by competitors—may inform the "substantial improvement" analysis.\textsuperscript{190} Ultimately, adopting earlier terminology, "substantial improvements" would encompass both "radical" improvements as well as the upper technical end of "significant" improvements.\textsuperscript{191}

Additionally, courts should also consider the economic significance of an improvement. Drawing on another test from physical property doctrine, accession would apply where the improvement confers substantial economic value relative to the original patented invention. This would generally arise where the value of the improvement dominates the value of the underlying patent in some new technology. Of course, distinguishing these values can

186. See infra Section V.B.2.
187. By requiring that improvements must demonstrate both technical and economic importance, this proposal parallels compulsory "dependency license" provisions from international and foreign patent law. See infra notes 296–303.
191. See supra Section I.A.
be quite difficult. This difficulty is compounded by the open-ended nature of patent claims, which cover an infinite set of physical embodiments possessing particular properties. For example, in comparing the value of a patented genus (e.g., the basic design of a toothbrush) with an improved species that falls within the genus (e.g., an electric toothbrush), one could argue that the value of the pioneer patent already encompasses the value of the infringing improvement (as well as all other species within the genus). To avoid this circularity and concretize the inquiry, economic analysis should focus, where available, on discrete products. Where a pioneer patentee produces or licenses a particular product and the improver also produces some product, the relative price, profit, and market share of the original and improved products may serve as proxies for determining substantial economic improvement. While valuation is likely to remain difficult, courts need only resolve disputes in favor of infringers in clear cases; where information is inadequate or judgments are "too close to call," a default presumption against a finding of substantial economic improvement would apply. Again, this high standard would screen out a significant proportion of economically trivial improvements for which the cost and uncertainty of liability-rule protection may not be justified.

This proposal would enhance patent law's treatment of technological improvement in several ways. To begin, this proposal would generally leave untouched patent law's treatment of "minor" improvements that are not independently patentable. If a subsequent party only trivially modified some patented invention, the pioneer patent would continue to dominate that subpatentable improvement. This proposal, however, would change the landscape for certain classes of "significant" (i.e., independently patentable)

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192. As a general matter, this proposal focuses not only on the claimed inventions described in patents but also on actual products that patentees have introduced to the market. While acknowledging that claims define the scope of exclusive rights, this proposal notes that the business practices of patentees—and the nature of the products that they produce, if any—are highly relevant to determining appropriate remedies for infringing those rights. Cf. eBay Inc. v. MercExchange, L.L.C., 547 U.S. 388, 396 (2006) (Kennedy, J., concurring) (suggesting that injunctive relief may be inappropriate for certain patent holders that produce nothing and merely assert exclusive rights as a bargaining tool).

193. See Merges, Blocking Patents, supra note 56, at 79 (providing a schematic example of such comparative valuation).

194. For a fuller exposition of the benefits of this proposal, see infra Section V.A.

195. See supra Section I.A. In theory, it is possible that a "minor" improvement to a patented invention may be technically trivial, such that it does not satisfy the requirements of independent patentability (especially nonobviousness), yet economically substantial, such that the improved item derives a substantial majority of its value from the improvement rather than the underlying patented invention. Amy L. Landers, Response, Patent Valuation Theory and the Economics of Improvement, 88 Tex. L. Rev. See Also 163, 165 (2009), available at http://www.texaslrev.com/sites/default/files/sealso/vol88/pdf/88TexasLRevSeeAlso163.pdf ("[A] modest technological advance may, due to luck or calculation, become economically significant simply because a market has opened for reasons unrelated to the invention."). Even for inventions within this class, however, the case for applying accession is difficult to make, as the absence of independent patentability counsels in favor of allowing the pioneer patent to dominate the improvement.
and “radical” improvements. Recall that in the tripartite scheme outlined above, blocking patents encourage voluntary negotiations between a pioneer patentee and a subsequent inventor who independently patents an improvement.\(^{196}\) As we have seen, however, transaction costs and strategic behavior may prevent an agreement from arising. Even if one does arise, the split of rents may be skewed in a fashion that undermines incentives to improve. Enforcing the underlying patentee’s rights with a liability rule rather than a property rule would remove a significant source of leverage,\(^{197}\) thus facilitating an arrangement in which one or both parties could practice the improved invention.

This proposal also ameliorates current limitations concerning “radical” improvements.\(^{198}\) While in theory the reverse doctrine of equivalents relieves radical improvers of infringement liability, that doctrine is largely moribund.\(^{199}\) The current proposal allows radical improvers to pay royalties instead of face an injunction if they continue to practice their new technologies. Application of a liability rule would thus mitigate patent holdup predicated on the pioneer’s strict right to exclude.\(^{200}\)

In advancing this proposal, this Article does not argue for a precise analogy between accession in the patent and physical property contexts. Indeed, several important distinctions exist. First, in the physical property context, accession operates as an equitable doctrine when return of some tangible asset is either impossible (because its physical identity has changed) or unjust. In the patent context, these concerns do not apply in the same manner: an infringer who substantially improves on a patented invention does not alter the identity of the underlying patent. Accordingly, it is both logically and legally possible for the original patentee to maintain strict exclusive rights over the same resource (the pioneer patent) even though it has been substantially transformed by another.

Second, the “default” condition that accession modifies in the physical property context is different from that in the patent context. In the former, the default rule gives the original property owner full and exclusive title to resources derived from his property, leaving the improver with nothing. In the patent context, the default condition already envisions (blocking) patent

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196. \textit{See supra} Part I.
197. \textit{Cf.} Parchomovsky \& Stein, \textit{supra} note 16, at 1533 (proposing an “added-value doctrine” for copyright in which a copyrighted work that is less original than an infringing work would receive liability-rule protection).
198. \textit{See supra} Part I.
199. Interestingly, Parchomovsky and Stein draw from patent law’s reverse doctrine of equivalents to propose a “doctrine of inequivalents” for copyright that would exempt exceptionally creative and original works from infringement liability. Parchomovsky \& Stein, \textit{supra} note 16, at 1525–32. My proposal differs in that even substantial improvements to patented inventions may still be subject to infringement liability. This proposal is not intended to supplant the reverse doctrine of equivalents, which would still be available to courts. Rather, it creates additional flexibility by focusing not on completely eliminating liability but on calibrating an appropriate remedy for substantially improving infringers.
rights for the substantial improver; she thus has something even in the absence of the accession rule.\footnote{201} This Article argues, however, that substantial improvements deserve more protection than the current blocking patents paradigm provides. Rather than argue for direct conceptual identity, this Article proposes that patent remedies analysis apply the accession \textit{insight} that a meaningful degree of ownership should shift when one party makes substantial, value-enhancing improvements to the property of another.\footnote{202}

Third, the “value-added” character of the underlying assets subject to the accession rule differ markedly in both contexts. In the typical case of physical property accession, the underlying asset is a raw material, such as wood,\footnote{203} corn,\footnote{204} grapes, olives, or wheat.\footnote{205} Any transformative improvement of those materials into hoops, whiskey, wine, oil, or bread appears quite dramatic, due in part to the unrefined nature of the original resource. In the patent context, however, the starting material subject to transformative improvement is itself a highly refined asset, namely a patented invention. While this status may render “transformation” less visibly obvious, it should not foreclose application of the accession insight. It is, of course, possible to enhance the value of an already “cooked” material as well as a “raw” one.\footnote{206} After all, it is this \textit{marginal} added value that the accession rule endeavors to protect. The underlying logic of accession does not distinguish between improvements to “raw” or “cooked” source materials.

Fourth, the role and sufficiency of accession in transferring title differs between the patent and physical property contexts. In the physical realm, accession alone justifies shifting ownership of some improved property from plaintiff to defendant. This proposal, however, offers the accession insight as a consideration that can inform, to varying degrees, each of the four factors in the \textit{eBay} analysis. While substantial improvement of a patentee’s invention would weigh in favor of liability-rule protection, other considerations encompassed in the \textit{eBay} framework may make that conclusion more or less legally tenable.

\footnote{201}{Given the presence of overlapping exclusive rights, however, the value of this \textit{something} is heavily dependent on the pioneer patentee’s willingness to license the underlying patent. \textit{See supra} Section I.B.}

\footnote{202}{This proposal thus represents a “simultaneous pliability rule” in which there are “at least two different stages of property or liability-rule protection, and the fulfillment of a predetermined condition triggers a shift from one type of protection to the other.” Abraham Bell \& Gideon Parchomovsky, \textit{Pliability Rules}, 101 MICH. L. REV. 1, 49 (2002). Unlike other simultaneous pliability rules in intellectual property law, such as copyright’s fair use doctrine, this proposal would require the unauthorized user to compensate the original intellectual property owner.}

\footnote{203}{\textit{See}, e.g., Wetherbee v. Green, 22 Mich. 311 (1871).}

\footnote{204}{\textit{See}, e.g., Silsbury v. McCoon, 3 N.Y. 379 (1850).}

\footnote{205}{\textit{See} 2 WILLIAM BLACKSTONE, \textit{supra} note 18, at *404.}

\footnote{206}{\textit{See} Lee, \textit{Intellectual Infrastructure}, \textit{supra} note 103, at 44 \& n.16 (discussing the concepts of “raw” and “cooked” intellectual assets).}
1. Mental State

While analogies can illuminate, doctrines must be tailored to individual fields and contexts. Along the lines of distinctions, this Article proposes a very different approach to the requirement of good faith when adapting accession to patent law. This Article applies the general accession insight that substantially improving infringement should result in liability-rule protection of an underlying asset. However, while good faith plays a critical role in physical property applications of accession, I suggest that in the patent context, the mental state of the defendant should simply be one factor that informs the grant or denial of injunctive relief. Ultimately, the unique character of patent law and the availability of other safeguards that serve a similar function counsel against adopting a strict good faith requirement in the present proposal.

Since the civil law origins of accession, courts applying the “mistaken improver” doctrine have placed great emphasis on the requirement of good faith. As a doctrinal matter, courts generally hold that those who improve property that they know belongs to someone else may not benefit from this equitable rule. As a policy matter, the good faith requirement plays an important role in discouraging strategic behavior. Absent this requirement, improvers would have strong incentives to knowingly and intentionally convert personal property owned by others, secure in the knowledge that if they substantially improved that property, they could force a sale at a court-determined price. Such forced sales tend to undercompensate property owners, thus providing a windfall for improvers.

While concerns over strategic behavior apply to the patent realm as well, the particularities of that field call for a different approach to mental state. For a variety of pragmatic and policy reasons explained below, I do not propose a strict good faith requirement for an infringer to benefit from the accession insight in patent law.

Of course, courts can and should consider the good faith of a substantially improving infringer as a factor weighing in favor of extending liability-rule protection to a pioneer patent. For reasons analogous to the physical property context, the case for accession is arguably most compell-

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207. See Wetherbee, 22 Mich. at 315–16; Silsbury, 3 N.Y. at 387.

208. In some instances, however, courts have granted title even to improvers who willfully took someone else’s property. See Arnold, supra note 121, at 105–06 (discussing the “physical identity” approach to accession cases, in which ownership of the ultimate product depends not on the good faith of the improver but on whether the identity of the property has fundamentally changed).

209. See id. at 107 (stating that courts following a willful trespass approach to accession generally deny knowing improvers a right to the property they improve).

210. See infra Section V.B.2.

211. Cf. Hynix Semiconductor Inc. v. Rambus Inc., 609 F. Supp. 2d 951, 970 (N.D. Cal. 2009) (“But where infringement is not willful, perhaps because of serious questions as to the patent’s validity . . . the potential destruction of an infringer’s business should carry some weight in the balancing of harms under the four-factor test reaffirmed in eBay.”).
ling for parties who infringe in good faith. Here, the “taking” of another party’s intellectual property is unintentional, and a court must allocate property rights and compensation between two “innocent” parties. As a general matter, defendants could manifest good faith in several ways. First, as with physical accession, a truly “innocent” infringer who did not know and did not have good reason to know of the existence of a patent would demonstrate good faith. Second, an infringer who knew about a patent but had a good faith belief that the patent was invalid, unenforceable, or not infringed by her product could also demonstrate good faith. This latter possibility is particularly likely given the notoriously indeterminate metes and bounds of many patent claims.

Although good faith would not be required, empirical evidence suggests that a significant proportion of infringers would likely satisfy this mental state. Empirical work by Chris Cotropia and Mark Lemley reveals that intentional “copying”—the classic exemplar of “bad faith” infringement—is quite rare in patent litigation. Their study of patent infringement suits from 2000 to 2007 found that plaintiffs only alleged copying in 10.9 percent of all complaints and that courts only found copying in 1.76 percent of all litigated cases. Among other implications, these findings suggest that most improving infringers do not knowingly copy or build on existing patented inventions when developing their improvements.

That being said, pragmatic and policy considerations, as well as the availability of other safeguards, counsel against a strict good faith requirement. First, as a doctrinal matter, courts applying eBay have denied injunctive relief even in cases involving willful infringement.

212. See Merges, Property Rules, supra note 50, at 2658 (“[A]n infringer may have no way of knowing that her own independent invention is an infringement, or that, at the time she makes her investment decisions, a patent even exists.”).

213. In this circumstance, an infringer would most likely establish good faith by obtaining an opinion letter from patent counsel. Cf. In re Seagate Tech., LLC, 497 F.3d 1360, 1369 (Fed. Cir. 2007) (en banc) (suggesting that opinion of counsel, though not necessary, is an important consideration in avoiding willful infringement). Although good faith infringement is not necessarily coextensive with the absence of willfulness, doctrine regarding willful infringement may be helpful in analyzing good faith.


216. Id. at 1424.

217. Id. at 1465.

willful infringement is not necessarily coextensive with the absence of good faith, these rulings suggest that culpable mental state should not automatically foreclose the possibility of liability-rule protection of an infringed patent. Indeed, other factors such as the adequacy of legal remedies, the balance of hardships, and the public’s interest in accessing some improved technology may plausibly outweigh a defendant’s knowing infringement in deciding whether to issue injunctive relief.219 Second, mental state inquiries are costly, and a good faith requirement may be particularly costly in patent law. As a general matter, mental state inquiries impose substantial difficulties on courts. Ascertaining the contents of a defendant’s mind is always challenging, particularly if she has a strong incentive to represent herself as acting in good faith. Furthermore, a strict good faith requirement may encourage inefficiently high search expenditures on the part of potential infringers.220 It is important to note that the costs of ascertaining and avoiding prior ownership interests are likely to be much higher in the patent context than in the physical property context.221 While boundary disputes arise in real estate, the existence of land registries provides fairly clear notice of property rights. Similarly, the physical proximity of chattel to an owner or her land renders ownership interests in tangible personal property relatively easy to ascertain. Such is not the case with patents. While patents are published and readily accessible, the “notice” that they provide may be quite lacking. As Christopher Newman observes, the mere existence of a patent does not necessarily indicate the presence of a valid property interest, as close to half of all litigated patents are ruled invalid.222 Furthermore, even assuming that a patent is valid, questions still remain about its enforceability223 and whether an improved technology actually infringes it. Indeed, obtaining conclusive determinations of validity, enforceability, and infringement may require litigating a case to final judgment, which is a very expensive proposition.224 Ultimately, the difficulty of ascertaining and avoiding prior ownership interests calls into question the cost justification and administrability of a strict good faith requirement.

219. See infra Section IV.A.2.
220. See Sterk, supra note 214, at 1331–33.
222. Id. at 117. See John R. Allison & Mark A. Lemley, Empirical Evidence on the Validity of Litigated Patents, 26 AIPLA Q.J. 185, 194, 205 (1998) (finding in a set of cases from 1989 to 1996 that 46 percent of final validity decisions by district courts and the Federal Circuit held the patent at issue invalid).
223. Defendants commonly allege that patents are unenforceable because of inequitable conduct on the part of the patentee during prosecution. Inequitable conduct has been the subject of much doctrinal controversy, which the Federal Circuit has recently attempted to resolve. See Therasense, Inc. v. Becton, Dickinson & Co., Nos. 2008-1511, 2008-1512, 2008-1513, 2008-1514, 2008-1595, 2011 WL 2028255 (Fed. Cir. May 25, 2011) (en banc).
Third, viewed from another perspective, insisting on good faith may create perverse incentives for potential infringers to not search patents. If an infringer could only benefit from accession by infringing in “good faith,” he might be discouraged from searching for and finding patents, thereby jeopardizing his good faith status. This reluctance to search would undermine the teaching function of patents and tend to inhibit cumulative technical advance. In sum, a variety of doctrinal and pragmatic reasons counsel against adopting a mental state requirement for the accession rule.

While the absence of a good faith requirement raises anxieties about rampant intentional infringement by potential improvers, several mechanisms are available to discipline such behavior. First, as noted above, the requirement of “substantial improvement”—which has both technical and economic dimensions—promises to constrain significantly the universe of improving infringements that would qualify for accession treatment. Second, patent law already contains provisions that deter willful infringement. Again, while the definition of willful infringement is not necessarily coextensive with the absence of good faith, willfulness doctrine can serve a salutary function by discouraging knowing infringement of existing patents. The ability of courts to treble damages for willful infringement provides a strong incentive against acting in an objectively reckless manner with respect to existing property rights. However, though the willful infringement doctrine can help police infringing behavior for the reasons noted above, a finding of willful infringement should not automatically lead to the grant of injunctive relief.

225. *Cf.* Sterk, supra note 214, at 1313 (arguing that protecting “innocent encroachers” with a liability rule creates “perverse incentives not to search”). This is, of course, a prominent criticism of the current willful infringement regime. *See generally In re Seagate*, 497 F.3d 1360, 1371 (Fed. Cir. 2007) (en banc) (establishing the current “objective recklessness” standard for willful infringement).


227. *See id.*

228. *See Newman, Patent Infringement, supra* note 17, at 120 (stressing the role of willful infringement doctrine in encouraging knowing infringers to settle with patentees).

229. *Cf. id.* (arguing that willful infringement should not render a defendant ineligible to invoke the accession rule). The availability of liability-rule treatment even for willful infringers raises a related question of whether ongoing royalties should be enhanced, since, almost by definition, prospective infringers would be willful infringers. While case law is still developing in this area, early decisions cast doubt on the appropriateness of enhancing ongoing royalties for postjudgment infringement based on willfulness. *See, e.g.,* Paice LLC v. Toyota Motor Corp., 609 F. Supp. 2d 620, 624 (E.D. Tex. 2009) (“[W]hen an injunction is not proper under eBay, the question instead becomes: what amount of money would reasonably compensate a patentee for giving up his right to exclude yet allow an ongoing willful infringer to make a reasonable profit?”); *cf. Amado v. Microsoft Corp.*, 517 F.3d 1353, 1362 (Fed. Cir. 2008) (vacating the district court’s enhanced damages award based on continued infringement after staying an injunction). As Mark Lemley notes, this reluctance to enhance ongoing royalties makes sense given that a court has already “decided that the defendant should be allowed to continue to sell the infringing product because enjoining it imposes too great a hardship on either the defendant or the public.” Mark A. Lemley, *The Ongoing Confusion Over Ongoing Royalties* (Stanford Law Sch. Pub. Law & Legal Theory Research Paper Series, Working
2. Integrating the Accession Insight within the eBay Analysis

Under this proposal, elements critical to accession doctrine in the physical property context—such as considerations of value-enhancing improvement—would be subsumed within the four-factor eBay framework. It is important to stress that the plaintiff carries the burden of proving each of the four eBay factors to justify a grant of injunctive relief.230 It is, of course, difficult to establish categorical rules for this holistic framework,231 and it is not the case that accession will necessarily trump all other considerations. Nonetheless, it is worth highlighting how substantial improvement of a pioneer patent would weigh against enjoining infringement.232

First, the plaintiff must establish that the improver’s infringement caused irreparable injury.233 As a general matter, introducing a substantially improved (and infringing) technology will tend to cause irreparable injury, thus tipping this factor in favor of the patentee. However, this need not be the case. In examining this factor, courts applying eBay have rejected a presumption that irreparable harm arises from the mere fact of patent infringement.234 In general, harm to the patentee is greatest in cases of direct competition with the infringer.235 But where the patentee produces a “basic”


231. This proposal thus adheres to the principle of “nonabsolutism” in applying patent infringement remedies. See Golden, Remedies, supra note 32, at 553–55. I use the term “holis-tic” to highlight the contextually sensitive nature of the eBay standard, which considers more situational factors than the Federal Circuit’s previous test for granting injunctive relief.


233. eBay, 547 U.S. at 391. As John Golden notes, it is somewhat curious why the Supreme Court framed this requirement in the past tense, as it seems that the operative question is whether the defendant’s ongoing infringement would constitute an irreparable injury. John M. Golden, The Supreme Court as “Prime Percolator”: A Prescription for Appellate Review of Questions in Patent Law, 56 UCLA L. Rev. 657, 695–96 (2009).


technology and has no plans or technical capacity to market an improvement, direct competition may be absent, and irreparable injury may be more difficult to establish. Along these lines, even if an infringing technology is a substantial improvement, it may not necessarily displace the pioneer patentee’s product. In some cases, market bifurcation may arise whereby the original technology remains a viable “low-cost” alternative to the improvement.236 While the original patentee will likely face some price erosion from the improvement’s entry into the market, it is possible that this harm may be adequately redressed through monetary compensation.237 Depending on the circumstances, the lack of direct competition between a substantial improvement and an existing patented technology may weigh against a finding of irreparable injury.238

Second, a plaintiff must demonstrate that remedies at law, such as damages, are inadequate to compensate for the injury.239 Here, the accession insight weighs strongly against enjoining a substantially improved technology. Where substantial improvements, rather than an underlying patent, dominate the value of some new technology, damages may be adequate to compensate for infringement, and enjoining the technology may be excessive.240 This is particularly the case for new technologies that fundamentally “transform” an underlying patented invention. Though analytically distinct, an analogy could be drawn to a complex, integrated system that infringes a patent covering a relatively minor component.241 In these cases as well, damages may sufficiently compensate for infringement, and enjoining the

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237. Furthermore, even if the improvement completely displaces the legacy technology, courts must weigh this harm against the social benefits of competitive innovation. Cf. Keeble v. Hickeringill, (1707) 103 Eng. Rep. 1127 (Q.B.) (distinguishing legitimate economic competition from malicious interference with trade).

238. Cf. Gordon, supra note 32, at 238–48 (questioning the imposition of liability where a creator and free rider compete in separate markets and the plaintiff has no plans to enter the other’s market).


240. Cf. Hamilton v. Rock, 191 P.2d 663, 668 (Mont. 1948) (“The plaintiff [in an accession case] should not be permitted to enjoy the fruits of defendant’s labor without paying therefor.”); Gordon, supra note 32, at 259 (“Injunctions bring with them the threat of over-deterrence because a defendant’s product may mix inextricably the defendant’s own resources with those of the plaintiff.”); Lemley & Weiser, supra note 90, at 785 (noting that in some situations, “injunctive relief can systematically overcompensate plaintiffs and over deter defendants, with significant negative consequences for innovation and economic growth”); Sterk, supra note 214, at 1329 (“The problem is exacerbated when the infringed material represents a small fraction of the value of significant infringing work.”).

241. See Lemley & Shapiro, supra note 47.
As we will see, case law applying eBay has already recognized and applied this core concept.243

Third, the plaintiff must show that the balance of hardships between the plaintiff and defendant favors an equitable remedy.244 Here again, the accession insight weighs against an injunction. As discussed in the context of the first two factors, the plaintiff's hardship from ongoing infringement may not be so great if (1) the plaintiff and defendant are not direct competitors, and (2) damages adequately compensate for the infringement. On the other side of the ledger, the fact that the defendant created a substantial improvement suggests that she would endure considerable hardship (in the form of wasted effort and unrealized commercial value) if the court awarded an injunction. This hardship would be particularly likely if the defendant has made significant, irreversible investments in practicing the improved technology.245 As Newman notes, such situations are ripe for patent holdup where a pioneer patentee may extract a disproportionate share of rents from parties who have few alternatives to practicing a patent.246

Finally, the plaintiff must show that the public interest would not be disserved by a permanent injunction.247 Here as well, accession weighs against enjoining an improved technology. The Federal Circuit has consistently articulated a public policy interest in maintaining incentives to invent by protecting patents with a strong right to exclude.248 On occasion, however, courts have determined that the public interest weighs against enjoining patent infringement.249 In particular, courts have sometimes permitted continued infringement of an “upstream” patent to promote “downstream”

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243. See infra Section IV.B.

244. eBay, 547 U.S. at 391.

245. See Hynix Semiconductor Inc. v. Rambus Inc., 609 F. Supp. 2d 951, 967 (N.D. Cal. 2009) (“Extensive sunk costs present another opportunity for a patent holder to extract a disproportionate sum from an infringer because the infringer cannot recover its existing investment.”).


247. eBay, 547 U.S. at 391.

248. See, e.g., Patlex Corp. v. Mossinghoff, 758 F.2d 594, 599 (Fed. Cir. 1985) (noting that the “encouragement of investment-based risk is the fundamental purpose of the patent grant, and is based directly on the right to exclude”); Tivo Inc. v. Echostar Commc’ns Corp., 446 F. Supp. 2d 664, 670 (E.D. Tex. 2006) (“The public has an interest in maintaining a strong patent system.”).

249. This is most evident in cases involving health-related patents. See, e.g., Vitamin Technologists, Inc. v. Wis. Alumni Research Found., 146 F.2d 941, 945 (9th Cir. 1945); City of Milwaukee v. Activated Sludge, Inc., 69 F.2d 577, 593 (7th Cir. 1934); cf. Hybritech Inc. v. Abbott Labs., 4 U.S.P.Q.2d (BNA) 1001, 1015 (C.D. Cal. 1987) (“Whatever else the court does, it will not cut off the supply of [patented] monoclonal test kits for cancer patients who are now using the [infringing] Abbott product.”), aff’d, 849 F.2d 1446 (Fed. Cir. 1988).
productivity. Such interests are particularly at issue when a party seeks to practice a substantially improved technology that infringes an existing patent. In these cases, the public would benefit considerably from the improved technology, and denying an injunction may in fact advance the patent system’s overall goal of promoting technological progress.

3. Facilitating Appropriate Compensation

Under this Article’s proposal, accession would operate within the multi-factor eBay framework to weigh against enjoining a substantially improved technology that infringes some underlying patent. However, denying the injunction is not the end of the story. In traditional accession doctrine, awarding title to the improved item to the defendant is contingent upon the defendant compensating the original property owner for the value of the source material. By analogy, courts applying this proposal would generally compel a defendant to pay royalties to a pioneer patentee as a condition of ongoing infringement. The determination and enforcement of such royalties, however, could proceed along two very different paths.

First, and preferably, the parties themselves could negotiate an ongoing royalty. As discussed further below, the difficulties of valuing technologies and determining appropriate compensation may complicate court-determined royalty awards. Therefore, in applying accession, courts denying injunctive relief should first direct the parties to negotiate an ongoing royalty between themselves. This approach would both decrease burdens on courts and enhance the accuracy of valuations, and it has become standard practice for courts applying eBay. As the Federal Circuit observed in Paice LLC v. Toyota Motor Corp.:
In most cases, where the district court determines that a permanent injunction is not warranted, the district court may wish to allow the parties to negotiate a license amongst themselves regarding future use of a patented invention before imposing an ongoing royalty. Should the parties fail to come to an agreement, the district court could step in to assess a reasonable royalty in light of the ongoing infringement.\textsuperscript{257}

Ultimately, this proposal to limit injunctive relief is best understood not as a mechanism to displace private ordering. Rather, it seeks to encourage negotiations between private parties while modifying the balance of power\textsuperscript{258} between them by eliminating a pioneer's categorical right to exclude.\textsuperscript{259} Under this proposal, parties would negotiate in the "shadow" of a court-imposed liability rule rather than against a background of strict exclusive rights.\textsuperscript{260}

Second, however, if private negotiations failed, a court could directly calculate and award an ongoing royalty. As an initial matter, some commentators have expressed doubt over the authority of courts to issue ongoing royalties after denying an injunction.\textsuperscript{261} For example, Tómas Gómez-Arostegui has reviewed the history of patent and copyright actions in the United States and England, concluding that U.S courts lack legal and equitable authority to award compulsory prospective compensation for postjudgment infringement.\textsuperscript{262} These conclusions, however, are contested on historical and legal grounds.\textsuperscript{263} Furthermore, as a matter of positive doctrine, the Federal Circuit has affirmed that courts are in fact empowered to grant ongoing royalties,\textsuperscript{264} and several have done so.\textsuperscript{265} Substantively, at least one

\begin{itemize}
  \item the parties to be \textit{reasonable} in their negotiations." (citing Telecordia Techs., Inc. v. Cisco Sys., Inc., 592 F. Supp. 2d 727, 748 (D. Del. 2009)).
  \item Paice LLC v. Toyota Motor Corp. (\textit{Paice II}), 504 F.3d 1293, 1315 (Fed. Cir. 2007).
  \item See Merges, \textit{Blocking Patents}, supra note 56, at 77 (noting that under historical, pro-injunction jurisprudence, the patentee may set the terms of a license agreement in an infringement settlement negotiation).
  \item Cf. Lee, \textit{Intellectual Infrastructure}, supra note 103, at 109; Merges, \textit{Blocking Patents}, supra note 56, at 76 (observing that uncertainty regarding whether courts will apply the reverse doctrine of equivalents encourages parties to strike deals in more cases).
  \item Theoretical work by Ian Ayres and Eric Talley shows that, contrary to conventional sentiment, "untailored" liability rules (i.e., liability rules that are somewhat divorced from actual damages) may encourage more negotiations between plaintiffs and defendants than property rules. Ian Ayres & Eric Talley, \textit{Solomonic Bargaining: Dividing a Legal Entitlement To Facilitate Coasean Trade}, 104 YALE L.J. 1027, 1036–72 (1995); see infra Section V.A.2.
  \item Gómez-Arostegui, supra note 261, at 1664–65.
  \item See Lemley, \textit{Ongoing Royalties}, supra note 229, at 5 n.19.
\end{itemize}
court has held that "when an injunction is not proper under eBay, the question then becomes: 'what amount of money would reasonably compensate a patentee for giving up his right to exclude yet allow an ongoing willful infringer to make a reasonable profit?'"266 In this vein, courts could draw on both longstanding and recent doctrine to analyze the appropriateness of a particular ongoing royalty.267

4. Illustrative Examples

To illustrate this proposal, consider a historical example involving radio technology. In the early twentieth century, the Marconi Wireless & Telegraph Company patented a series of oscillating radio diodes.268 Lee De Forest, a leading inventor of radio technology, patented a substantial improvement, the oscillating triode, which amplified electrical signals and thus exhibited much greater sensitivity in radio reception.269 This triode both incorporated and improved on the earlier diode. Ultimately, AT&T obtained De Forest's triode patents and attempted to commercialize the technology. However, Marconi sued for infringement, and the Southern District of New York held that De Forest's triode infringed one of Marconi's diode patents.270 Neither party would license the other, and no firm exploited this important technology for an extended period of time.271

Under my proposal, a court applying the eBay framework would take greater account of the considerable technological and economic value of De Forest's improvement over Marconi's pioneer patent. Such considerations would weigh in favor of enforcing Marconi's patent with a liability rule rather than a property rule. The court would then direct the two parties to negotiate an ongoing royalty and would impose one itself if they failed to do so. In this manner, through applying the accession insight, a court could enforce Marconi's patent in a manner that facilitated dissemination of the substantial improvement.272

A more recent case provides another illustrative example. In the 1980s, Genetics Institute ("GI") patented "isolated and purified" erythropoietin ("EPO"), a hormone that regulates red blood cell production. While GI


267. See infra Section V.B.2.

268. Ayres & Talley, supra note 260, at 1093; see also Merges & Nelson, supra note 31, at 891.

269. As an indication of the importance of De Forest's invention, the triode has been called "the heart and soul of radio," GEORGE H. DOUGLAS, THE EARLY DAYS OF RADIO BROADCASTING 8 (1987).


272. See Ayres & Talley, supra note 260, at 1093.
utilized traditional techniques to isolate and purify this hormone, Amgen began producing EPO through the use of recombinant DNA technology. Among other advantages, Amgen’s process conferred significant economic value; use of recombinant DNA technology greatly accelerated the production of EPO, thus facilitating clinical applications of this hormone for patients suffering from anemia. In Amgen, Inc. v. Chugai Pharmaceutical Co., Amgen and GI sued each other for patent infringement. While the Federal Circuit ultimately invalidated GI’s claims on enablement grounds, GI’s patent had the potential to hold up a significant technological advance. After all, while Amgen’s EPO represented a substantial improvement over GI’s patented invention, it technically fell within the scope of some of GI’s claims.

Under my proposal, had GI’s claims been affirmed as valid, GI would not have enjoyed a categorical right to exclude Amgen’s infringing improvement. Rather, due regard for Amgen’s substantial contributions in genetically engineering EPO would have counseled in favor of—at most—liability-rule protection of GI’s patent, thus facilitating the dissemination of Amgen’s important technology. Applying principles of accession within the eBay framework would help achieve this result.

B. Consistency with Recent Jurisprudence

While this proposal may appear radical, eBay and its progeny already reflect several elements of the accession insight. This proposal to apply accession doctrine relies critically on courts weighing the relative values of pioneer patents and accused improvements in determining whether to enjoin infringement. In a different sense, eBay itself already embraces this notion of comparing the relative values of patented inventions and accused products. In particular, Justice Kennedy’s eBay concurrence illustrates this insight:

When the patented invention is but a small component of the product the companies seek to produce and the threat of an injunction is employed

274. Amgen, 927 F.2d at 1217.
275. Merges, The Trouble with Trolls, supra note 37, at 1596.
276. From one perspective, Amgen represents a prime candidate for the reverse doctrine of equivalents, which would have completely relieved Amgen from liability for infringing GI’s patent on EPO. Cf. Scripps Clinic & Research Found. v. Genentech, Inc., 927 F.2d 1565 (Fed. Cir. 1991) (reversing summary judgment ruling that a genetically engineered protein infringed a patent on the same protein derived from purifying human blood); Lemley, Economics of Improvement, supra note 31, at 1011. As noted above, however, courts have been extremely reluctant to invoke the reverse doctrine of equivalents. The accession rule is not intended to displace that doctrine, but it does provide an intermediate (and perhaps more palatable) approach to allocating property rights and compensating patentees in the context of substantially improving infringement.
277. See Merges, The Trouble with Trolls, supra note 37, at 1610 (“What the Court recognized in eBay was that it must police the line between rent-seeking and innovation.”).
simply for undue leverage in negotiations, legal damages may well be suf-
ficient to compensate for the infringement and an injunction may not serve
the public interest.\textsuperscript{278}

This observation parallels the underlying logic of the accession insight,
which compels courts to compare the relative values of an underlying patent
and a broader, infringing technology when determining the appropriateness
of injunctive relief.

Courts have applied Justice Kennedy's instruction to deny injunctive re-
lied in cases in which a multifaceted product infringes a patent on a
relatively low-value component. For example, in \textit{z4 Technologies, Inc. v.
Microsoft Corp.},\textsuperscript{279} a jury found that Microsoft Windows and Office
infringed \textit{z4}'s patents on software activation technology.\textsuperscript{280} However,
the district court denied \textit{z4}'s request for injunctive relief. In analyzing irrepara-
able harm, the court observed that "Microsoft only uses the infringing
technology as a small component of its own software, and it is not likely
that any consumer of Microsoft's Windows or Office software purchases
these products for their product activation functionality."\textsuperscript{281} This considera-
tion also informed the court's analysis of the adequacy of legal remedies.
Citing Justice Kennedy's guidance, the court noted that "product activation
is a very small component of the Microsoft Windows and Office software
products" and that "[t]he infringing product activation component of the
software is in no way related to the core functionality for which the software
is purchased by consumers."\textsuperscript{282} Here, the fact that \textit{z4}'s patented component
contributed marginally to the overall value of Microsoft Windows and Office
weighed against granting an injunction.

Similar considerations informed the district court's denial of injunctive
relief in \textit{Paice LLC v. Toyota Motor Corp.}\textsuperscript{283} In that case, a jury found that
Toyota had infringed \textit{Paice}'s patents on hybrid transmission technology by
selling several lines of hybrid cars. However, the district court denied
\textit{Paice}'s request for an injunction.\textsuperscript{284} In analyzing the adequacy of damages,
the court observed, "The infringed claims relate to the hybrid transmissions
of the accused vehicles, but form only a small aspect of the overall vehicles.
The jury's damages award also indicates that the infringed claims constitute
a very small part of the value of the overall vehicles."\textsuperscript{285} In the court's view,

\begin{itemize}
\item \textsuperscript{278} eBay Inc. v. MercExchange, L.L.C., 547 U.S. 388, 396–97 (2006) (Kennedy, J.,
concurring); \textit{see also} Lemley & Weiser, \textit{supra} note 90, at 797–98 (describing this phenome-
non).
\item \textsuperscript{279} \textit{z4 Techs.}, 434 F. Supp. 2d at 438. The jury also found that codefendant Autodesk
had infringed \textit{z4}'s patents. \textit{Id.}
\item \textsuperscript{280} \textit{Id.} at 440.
\item \textsuperscript{281} \textit{Id.} at 441.
\item \textsuperscript{282} \textit{Paice I}, 2006 WL 2385139, at *6.
\item \textsuperscript{283} No. 2:04-CV-211-DF, 2006 WL 2385139 (E.D. Tex. Aug. 16, 2006) (\textit{Paice I}), \textit{aff'd in part,
rev'd in part}, 504 F.3d 1292 (Fed. Ctr. 2007) (\textit{Paice II}).
\item \textsuperscript{284} \textit{Paice I}, 2006 WL 2385139, at *6.
\item \textsuperscript{285} \textit{Id.} at *5.
\end{itemize}
this disparity in value helped to render damages adequate to compensate Paice for Toyota's infringement. 286

Thus, eBay and its progeny already exhibit elements of the proportionality analysis at the heart of accession doctrine. 287 To be sure, important distinctions are in order. z4 and Paice involved patentees seeking to enjoin multifaceted products (software and cars) that incorporated a relatively minor patented component. Analytically, these cases are distinct from the holder of a patented genus seeking to enjoin a party from practicing a substantially improved species that falls within that genus. Furthermore, distinguishing the values of, say, a product activation component and the rest of Microsoft Windows is likely easier than distinguishing the values of a patented genus and an improved species. 288 Nonetheless, at a conceptual level, the notion of proportionality still governs. Where the value of some technology derives substantially from a party's own technological contribution rather than from some underlying patent that it infringes, the rationale behind protecting that pioneer patent with a strict property rule loses force.

V. ADVANTAGES, OBJECTIONS, AND RESPONSES

A. Advantages

1. Encouraging Technological Improvement

The principal advantage of applying accession to patent infringement remedies is to encourage the dissemination of substantially improved technologies. This would occur in at least two ways. First, the proposal would facilitate technological improvement by parties other than the original patentee. Under the present system, transaction costs and strategic behavior may derail licensing negotiations in the blocking patents paradigm, and the reverse doctrine of equivalents is largely moribund. 289 Therefore, substantial improvers invent and market new technologies at their own peril. These technologies may infringe existing patents, and while pioneer patentees may agree to a license, the strict right to exclude affords them significant leverage over improvements. The current proposal would alter the playing field

286. Id.

287. See, e.g., Laserdynamics, Inc. v. Quanta Computer, Inc., No. 2:06-CV-348-TJW, 2010 WL 2574059, *2 (E.D. Tex. June 22, 2010) ("Further, the claimed invention embodied in the disc-drive is but one relatively small component of the entire assembled computer. When the patented invention is but a small component of the accused product, it weighs [sic] against a finding of a permanent injunction." (citation omitted)); Hynix Semiconductor Inc. v. Rambus Inc., 609 F. Supp. 2d 951, 966 (N.D. Cal. 2009) ("A patent to a technological sliver enables its owner to threaten to enjoin the manufacture of use of the entire device, and in turn, receive a payoff far greater than the value of its invention." (citation omitted)).

288. Of course, this is a relative claim, and assigning specific values to components within an integrated system may be quite challenging. Golden, Remedies, supra note 32, at 536.

289. See supra Section I.B.
by allowing a substantially improving infringer to face liability-rule rather than property-rule protection of a patent. The result would recalibrate the balance of power between pioneers and improvers and would enhance incentives for inventors to improve on existing patented technologies. Case studies of technological development have suggested that rivalrous competition—rather than broad control by a single party—often leads to the most fruitful technological advance. 290 Relaxing exclusive rights on the part of pioneer patentees may better achieve the conditions conducive to technological progress. 291

Second, this proposal would spur original patentees to invest in improving their own patented inventions. As a general matter, overcompensating patentees diminishes incentives to improve. 292 Along these lines, the Second Circuit has observed, "Many people believe that possession of unchallenged economic power deadens initiative, discourages thrift and depresses energy; that immunity from competition is a narcotic, and rivalry is a stimulant, to industrial progress." 293 Under the current proposal, pioneer patentees, particularly those who obtain broad genus claims in a field, may not rest on their laurels. The prospect of a subsequent party substantially improving on their technology and appropriating a significant portion of the social value of those improvements would spur pioneer patentees to continue to refine, rethink, and extend their own creations. 294 More precisely, it would encourage pioneer patentees to develop more advanced embodiments of their inventions throughout the full scope of their patent claims.

While curtailing a pioneer patentee's exclusive rights may enhance incentives to improve, the accession doctrine's high "substantial improvement" standard plays a valuable role in confining these incentives to the upper end of the technical and economic spectrum. Many attempts to improve on existing patents will not actually create substantial improvements; these "minor" improvements largely inure to the benefit of pioneer

290. Merges & Nelson, supra note 31, at 872. This observation helps mitigate concerns over potentially wasteful "racing" in which multiple firms engage in duplicative efforts to improve a technology. Kitch, supra note 173. Whatever social losses arise from such racing must be weighed against the benefits of more rapid technological improvement as well as positive externalities arising from the "race" to improve.

291. As a corollary benefit, liability-rule protection of pioneer patents may reduce the incentive for potential infringers to engage in inefficient patent searches. Sterk, supra note 214, at 1333; see also Paul J. Heald, Optimal Remedies for Patent Infringement: A Transactional Model, 45 Hous. L. Rev. 1165, 1189 (2008) ("When switching costs are high enough and a substantial premium can be extracted by the patentee in a post-adjudication licensing negotiation, the exploiting firm may invest excessively in searching for the patentee.").


293. United States v. Aluminum Co. of Am., 148 F.2d 416, 427 (2d Cir. 1945).

294. In this fashion, this proposal avoids one primary objection to divided entitlements: that such arrangements tend to reduce incentives for a property owner to improve his property because it may be subject to liability-rule protection at a later date. See Ayres & Talley, supra note 260, at 1085. Under this proposal, because a pioneer would avoid application of the accession rule by practicing the same or comparable improvement as an infringer, she faces significant incentives to improve and exploit her intellectual property.
patentees and provide questionable value for society as a whole. By insisting on a high standard of technical and economic improvement, the accession doctrine encourages truly substantive advances and discourages wasteful and potentially duplicative activity on the part of potential infringers. Additionally, by rendering accession difficult to invoke, this high standard helps shore up the expected value of a patent, thus maintaining strong initial incentives to invent. Like the patent principles to which it is conceptually related (namely, blocking patents and the reverse doctrine of equivalents), the “substantial improvement” standard helps mediate the interests of original property owners and improvers, balancing incentives to invent with incentives to improve on existing inventions.

Tellingly, international patent law already embraces elements of the accession insight. The Agreement on Trade-Related Aspects of Intellectual Property Rights (“TRIPS”) authorizes countries to grant compulsory licenses to the owner of a “dependent” patent that cannot be practiced without infringing another patent. Notably, one criterion for authorizing compulsory licenses is that “the invention claimed in the second [dependent] patent shall involve an important technical advance of considerable economic significance in relation to the invention claimed in the first patent.”

Similarly, the domestic patent laws of several foreign countries include compulsory “dependency license” provisions that provide for liability-rule protection where an underlying patent dominates an improved technology. Some of these countries, such as Japan and the Netherlands, have had these provisions for decades, while others, such as Taiwan and Brazil, appear to have enacted them in response to corresponding provisions in the

297. TRIPS Agreement, supra note 296, at art. 31(1)(i).
298. Merges, Blocking Patents, supra note 56, at 102–04; Howard C. Wegner, Patent Harmonization, in PUB. NO. C553, ABA-ALI COURSE OF STUDY MATERIALS: BIOTECHNOLOGY LAW 171, 223–25 (Am. Law Inst.-Am. Bar Ass'n Comm. on Continuing Prof'l Educ. ed., Nov. 8–9, 1990), available at Westlaw C554 ALI-ABA 171. Some countries, such as France, Italy, and Japan, grant licenses for all blocking patents, while others, such as China and Sweden, grant such licenses only where the improvement makes a “significant technical advance” over the existing patent. Merges, Blocking Patents, supra note 56, at 104. Interestingly, in many cases, dependency licenses are contingent upon the pioneer patentee also receiving a license to practice the improvement. Id. at 104–05.
TRIPS Agreement. While granting such licenses has been historically rare, anecdotal evidence suggests that some national authorities are becoming more willing to issue them. Ultimately, these statutory provisions reflect the accession insight that the emergence of a substantial improvement sometimes justifies curtailing a pioneer patentee’s right to exclude.

2. Promoting Private Ordering

Although counterintuitive, this proposal for court-determined liability-rule protection of patents may actually encourage greater negotiations between pioneer patentees and improvers. As a preliminary matter, consistent with current eBay practice, a court applying this proposal would first direct litigants to negotiate an ongoing royalty before imposing one itself. Nevertheless, even if a court were forced to calculate an ongoing royalty, such liability-rule protection may have unexpected benefits. Commentators routinely cite the difficulty of government bodies—whether courts or administrative tribunals—in accurately valuing damages, thus highlighting a significant deficiency of liability rules relative to property rules. Under this view, the comparative advantage of private parties over courts in valuing patents favors protecting such assets with a property rule. Thus, property-rule protection of patents is generally believed to be superior to liability-rule protection for promoting voluntary negotiations between private parties. However, this may not necessarily be the case.

While private negotiations may yield more accurate valuations than courts, it is not clear that property rules actually encourage more negotiations than liability rules. This proposal to apply accession in remedies analysis thus parallels work by Ian Ayres and Eric Talley demonstrating the advantages of liability rules in promoting private ordering. This work shows that liability rules and other forms of “divided legal entitlements” encourage entitlement owners to disclose information regarding private valuations, thus reducing transaction costs related to imperfect information and facilitating voluntary agreements. Essentially, liability rules create a “you cut, I pick” scenario in which parties do not know if they will ultimately be the seller or purchaser of an asset, thus reducing incentives for strategic


304. See, e.g., Merges, Blocking Patents, supra note 56, at 99–100.

305. Kieff, supra note 89, at 733–34; Merges, Property Rules, supra note 50, at 2664.

306. See Ayres & Talley, supra note 260, at 1037 (referring to the “folklore” that “property rules induce negotiation and contracting, while liability rules induce nonconsensual taking, subsequent litigation, and judicially determined prices” (internal quotation marks omitted)).

307. See id.

308. Id. at 1029–32.
behavior.\textsuperscript{309} This analysis is particularly relevant to “thin markets” susceptible to strategic bargaining,\textsuperscript{310} which often characterize patent licensing negotiations.\textsuperscript{311} According to this view, liability rules may actually encourage more private ordering than property rules.

Moving from theory to practice, empirical evidence indicates that in liability-rule regimes, parties overwhelmingly negotiate agreements rather than rely on court-determined compensation. In a recent study, Daniel Crane examined fifty-two antitrust consent decrees that contained liability-rule provisions for patents or copyrights.\textsuperscript{312} These provisions required defendants to license intellectual property on reasonable and nondiscriminatory terms, but the relevant court reserved jurisdiction to determine appropriate compensation if the parties could not agree.\textsuperscript{313} Notably, in only three of fifty-two cases was there any indication that the court actually stepped in to determine the royalty rate.\textsuperscript{314} In the vast majority of cases, parties successfully negotiated some mutually acceptable agreement in the shadow of liability rules. Ultimately, “[c]ourts rarely exercise their rate-setting powers even when

\textsuperscript{309} Id. at 1030, 1034. As this observation reveals, the setting of a “liability price” is not necessarily the end of the story. It may be the case that the improver finds the price too high and declines to exercise his option to practice the pioneer patent (as well as his own improvement). If this would cause a loss on the part of the patentee, she may choose to “sweeten the deal” by effectively lowering the ongoing royalty, thus inducing the improver to practice the pioneer patent. Alternatively, if the patentee places a high value on exclusivity, she could pay the improver to not exercise his option to practice the pioneer patent. And in blocking patents scenarios, the pioneer could theoretically buy a license from the improver and practice the improved invention herself.

\textsuperscript{310} Bell & Parchomovsky, \textit{supra} note 202, at 15–16.


In addition, one potential limitation in applying Ayres and Talley’s theory to accession has to do with timing. In Ayres and Talley’s framework, an entitlement holder either “bribes” a potential taker not to take an entitlement or “sells” her entitlement at a price lower than the damages amount. Ayres & Talley, \textit{supra} note 260, at 1038. Thus, bargaining in this framework proceeds in the presence of some \textit{known} damage amount authorized by a third party, usually a court. Such information, however, is not available if a court directs parties to negotiate an ongoing royalty \textit{before} calculating one itself. This limitation can be overcome in two ways. First, a court can “signal” a nonbinding but likely royalty before directing parties to negotiate. Second, parties can engage in another round of negotiation after a court declares its royalty, thus determining whether or not the royalty will be enforced. \textit{See supra} note 309.

\textsuperscript{312} Daniel A. Crane, \textit{Bargaining in the Shadow of Rate-Setting Courts}, 76 \textit{ANTITRUST L.J.} 307, 311–12 (2009) \textit{[hereinafter Crane, Bargaining]}.

\textsuperscript{313} Crane, \textit{Intellectual Liability, \textit{supra} note 23, at 294.}

\textsuperscript{314} Crane, \textit{Bargaining, \textit{supra} note 312, at 312.
they retain them,” and liability rules appear to be highly consistent with private ordering.

Notably, the inability of courts to precisely calculate damages—which is ordinarily seen as a defect of liability rules—may have some salutary effects. While most commentators suggest that liability rules typically undercompensate rights holders, it is possible that courts will err in the opposite direction and overcompensate rights holders, perhaps based on inflated market benchmarks. As Crane observes, the ambiguous directionality of court-ordered royalties presents an “unappetizing risk” for both plaintiff and defendant, thus encouraging private negotiations.

Imprecision in calculating damages may encourage private ordering for another reason as well. Ayres and Talley argue that untailored liability rules—those that are divorced from actual measures of damages—function best to promote private information disclosure and thus efficient contracting. Put differently, perfect tailoring of damages reduces plaintiffs’ incentive to reveal information, as they are no worse off if there is a nonconsensual taking. As applied here, the inability of courts to accurately assess damages in a liability-rule regime may not be as deleterious as first thought.

3. Realizing the Promise of Prospect Theory

Additionally, there may be efficiency gains when a substantially improving infringer is not subject to a pioneer patentee’s strict right to exclude. As noted, prospect theory helps to justify early, broad patents on the notion that an initial patentee can then coordinate the development of a technology, including related improvements. Commentators have questioned this assumption, noting the high information and transaction costs associated with a single party managing the development of an early-stage technological prospect.

Relatedly, it is far from clear that the initial patentee is the best party to develop an invention. This is especially true if a subsequent inventor has substantially improved the invention in a manner in which the pioneer has not. In this context, accession doctrine would play a salutary function by shifting meaningful ownership of the improved invention to the party who

315. Id. at 308.
316. Crane, Intellectual Liability, supra note 23, at 293.
317. Id. at 293–94.
318. See Ayres & Talley, supra note 260, at 1065 (“Tailoring can exacerbate strategic impediments to bargaining because tailoring gives the parties private information about the legal consequences of nonconsensual taking.”).
319. Id. at 1066.
has demonstrated a greater capacity to develop it.\textsuperscript{323} Put differently, accession helps ensure that the competence to develop an improved technology is internalized within its boundaries, thus optimizing modularity in the allocation of property rights.\textsuperscript{324}

Of course, the Coase theorem holds that in the absence of transaction costs, initial allocations do not matter, and costless transactions will allow resources to flow to their highest-valued use.\textsuperscript{325} However, a “true” reading of the Coase theorem emphasizes that transaction costs do matter, and so legal and regulatory systems should assign initial rights to the party best situated to make good use of them.\textsuperscript{326} Accession helps achieve this result by granting (relatively unobstructed) ownership of some technological improvement to a party that, from all external indicia, is well positioned to develop it.\textsuperscript{327}

Adapting Kitch’s argument, mitigating the strict exclusivity of a pioneer blocking patent and allowing the \textit{improver} to coordinate the development of an improved technology may better achieve the efficiency gains normally associated with prospect theory.

On the other hand, one could argue that accession may subvert the benefits of prospect theory insofar as pioneer patentees are discouraged from communicating their inventions to others. After all, a patentee may fear that others will substantially improve on his invention, thus foreclosing property-rule protection of his patent. This may discourage entering into licensing negotiations with outside parties, thus chilling commercialization. However, several considerations suggest that this concern is overstated. First, by virtue of obtaining a patent, the patentee has already “communicated” his invention to the technological community. Second, as discussed above, infringement—including improving infringement—rarely involves copying of a patented invention.\textsuperscript{328} Finally, accession may encourage pioneers to “get ahead of the curve” and license their inventions to a wide number of potential improvers \textit{before} they develop infringing improvements and can avail themselves of the accession rule.

\textsuperscript{323}See id. at 489 (“Instead of holding a competition, ownership is awarded to someone who has already demonstrated that she has the capacity to function as the owner of some prominently connected asset.”).


\textsuperscript{327}Cf. Smith, \textit{Property and Property Rules}, supra note 84, at 1783 (“If in some context we thought that takers systematically had an advantage in developing an asset and that transaction costs were so high that the taker could not purchase the asset in a consensual transaction . . . then there would be a reason to worry about property rules protecting an entitlement in existing owners.”).

\textsuperscript{328}See Cotropia & Lemley, supra note 215, at 1465 (noting that “[m]ost defendants in patent infringement lawsuits are not copiers”).
4. Advancing Fairness

In addition, although open to debate, accession in the patent realm may also enjoy the virtue of fairness. There is, as commentators have pointed out, a distinctly Lockean tenor to physical property accession, which converts protection of a resource from a property rule to a liability rule based on an innocent improver's substantial, value-enhancing contributions to some source material. Of course, fairness considerations would play out differently in the patent realm absent a good faith requirement on the part of infringers. At its core, however, accession in the patent context also rewards improvers based on their substantial technical and economic contributions to existing inventions. While modern patent law justifies itself on utilitarian grounds, historical conceptions of patent law placed more emphasis on rewarding value-enhancing labor and remunerating inventive effort. Accession in the patent realm would help promote these objectives by tying rights and remedies more closely to specific technological contributions.

Even acknowledging that accession would benefit some knowing infringers, the differing moral baselines of physical property law and patent law mitigate to some degree the perceived unfairness of such "intentional takings." Unlike physical property, patent law already grants property rights (in the form of blocking patents) to parties who significantly improve on resources owned by others. Patent law thus cabins existing ownership interests to encourage subsequent improvement. It thereby reflects the notion that the social benefits of improvement may trump a patentee's interest in maintaining sole exclusive rights in all future iterations of an invention. The present proposal would extend this principle by further rewarding (or at least not unduly punishing) the inventive efforts of substantial improvers, even those who knowingly infringe.

329. See Smith, Intellectual Property, supra note 16, at 1766–77 (noting the consistency of accession with Lockean labor theory); cf. Easterbrook, supra note 89, at 113 ("Treating intellectual property as property should appeal not only to utilitarians but also libertarians. Intellectual property is no less the fruit of one's labor than is physical property.").

330. See supra Section IV.A.1. As an empirical matter, it is worth noting that a substantial proportion of infringers that invoke accession would likely qualify for good faith mental status. See supra notes 215–217 and accompanying text.

331. See supra note 103.

332. Mossoff, supra note 88, at 718.

333. Notably, copyright law operates differently than patent law by vesting exclusive rights to "derivative works" in the original copyright holder. See 17 U.S.C. § 103(a) (2006); Lemley, Economics of Improvement, supra note 31.

334. But see Merrill, supra note 16, at 497–99 (arguing that accession challenges Lockean desert notions of property, for it "sweeps" in increments of value arising from happenstance and pure luck and assigns them to some original property owner). While Merrill's critique applies to most instances of accession, it seems somewhat inapposite to specificatio, wherein title to property transfers precisely because of some improver's valuable, transformative labor.
Viewed from a different perspective, the accession rule may prevent unjust enrichment on the part of the initial patentee. The current regime is biased in favor of pioneer patentees, who generally enjoy strict exclusive rights vis-à-vis infringing improvers. In some cases, these rights enable pioneers to appropriate a disproportionate share of the value of an improver's work. However, principles of fairness weigh against allowing a patentee to command excessive gains resulting from another party's substantial technological innovation.

The requirement of compensation also appeals to fairness. An improver of someone's property, whether an individual who converts wood to hoops or one who substantially improves on some patented technology, does not take the improved resource for free. Accession requires that the subsequent party compensate the underlying property owner for the value of the source material. Although such compensation may exhibit certain inadequacies, accession nevertheless strives to "provide[] restitution as one intermediate solution to the problem of intertwined inputs." This "splitting" function best achieves equity between two parties who have both contributed value to some improved property.

B. Objections and Responses

Of course, this proposal to protect pioneer patents with a liability rule when an infringer substantially improves on a protected technology must address several prominent objections.

1. Disrupting Settled Expectations

First, critics might object to the seemingly radical nature of this proposal, which diverges from the longstanding practice of protecting patents with a right to exclude. As the Supreme Court has observed, courts should be reluctant to "disrupt the settled expectations" of the inventive community. However, the law has never viewed consistency for consistency's sake as a great virtue. Additionally, at least two considerations suggest that this criticism is misplaced.

First, properly understood, the present proposal is quite modest. If an infringing improvement is minor, then (all other things being equal)...
traditional equitable principles will continue to favor enjoining infringement. Furthermore, even for “significant” (i.e., independently patentable) inventions, courts would have to determine if the improver’s contributions relative to the underlying patent were substantial enough to justify the accession rule. Thus, the vast majority of infringing improvement cases would likely not implicate accession. Even if an improvement were substantial enough to trigger accession, courts would first direct parties to voluntarily negotiate a license before imposing royalties. The “remarkable” application of a court-ordered liability rule would thus be a remedy of last resort. As noted above, this proposal is best understood as an “action-forcing” mechanism that still encourages private ordering, though it changes the background conditions against which parties negotiate.340

Second, after eBay, the ground has already shifted. Notwithstanding the current proposal, eBay has introduced a nontrivial degree of uncertainty in the prospect of obtaining an injunction after a finding of infringement. While statistics are limited, in the first thirty cases applying eBay, district courts issued permanent injunctions seventy-seven percent of the time, compared with eighty-four percent for pre-eBay cases.341 Additionally, certain patterns have begun to emerge, with denial of injunctive relief more likely if the plaintiff and defendant do not directly compete, the plaintiff is a nonpracticing entity, or the patented invention is only a small component of the accused device.342 Thus, a lower probability of obtaining injunctive relief is already a fact of life after eBay.343 The current proposal merely applies this flexibility in a manner designed to promote technological improvement.

Against the notion of disrupting settled expectations, it is worth noting that reducing liability based on significantly improving someone else’s intellectual property finds parallels in other fields as well. For example, one sees a similar dynamic in copyright’s fair use doctrine.344 In certain instances in which copyrighted content forms only a small portion of a new work, courts have relied on fair use to find that the work does not infringe.345 Additionally, when a subsequent party engages in “transformative use” of a copyrighted work, it may sometimes avoid liability under fair use.346 While

345. See, e.g., Bill Graham Archives v. Dorling Kindersley Ltd., 448 F.3d 605, 611 (2d Cir. 2006) (focusing in particular on the “transformative” use of copyrighted material).
my proposal differs from fair use, it reflects a similar insight that in some cases, transformative use of intellectual property should mitigate the full brunt of the right to exclude.

2. Identifying Substantial Improvements and Calculating an Ongoing Royalty

Critics of this proposal are likely to cite the technical difficulties of implementing accession and the limited competence of courts to perform this task. Along these lines, applying accession to patent infringement suits requires at least two complicated sets of valuations. First, courts must compare the values of a patented invention versus an improved technology that infringes it. As Christopher Newman notes, the fact that underlying patented inventions are novel, nonfungible assets that are not commonly traded on robust markets renders valuations particularly difficult. Second, if a court deems that accession is triggered and denies an injunction, it must be prepared to calculate an ongoing royalty to compensate the pioneer patentee for prospective infringement. As I have noted in other work, eBay's

347. Notably, Maureen O’Rourke has proposed a doctrine of fair use for patent law. Maureen A. O’Rourke, Toward a Doctrine of Fair Use in Patent law, 100 Colum. L. Rev. 1177 (2000). While I note fair use for conceptual comparison, my proposal is not a patent analogue to that copyright doctrine. First, I propose accession as a narrow, tailored mechanism for addressing infringing improvements rather than as a broad standard for allowing unauthorized uses of patented inventions more generally. Second, while fair use eliminates liability (and any obligation to provide a remedy), under my proposal defendants would still be liable for infringement and would have to compensate the plaintiff. In this respect, I share common ground with O’Rourke’s adaptation of fair use to patent law. Id. at 1209 (noting that in some cases, a party claiming fair use would be obligated to compensate the plaintiff). However, while O’Rourke’s article was written prior to eBay, my proposal for liability-rule protection is situated in the Supreme Court’s current injunctions framework as well as recent case law addressing damages.

348. Cf. Newman, Patent Infringement, supra note 17, at 88 (noting, in the physical property context, that accession requires courts to “evaluate the relative contributions of the original resource and the improver’s contributions” to an improved asset).

349. Id. at 113–14; see also Ayres & Talley, supra note 260, at 1092 (“Intellectual property often entails a significant amount of thin-market bargaining.”); Merges, Blocking Patents, supra note 56, at 77 (“[B]y definition each asset covered by a patent is in some sense unique—a characteristic guaranteed by various requirements for protectability in the patent statute.”).

350. The difficulty of calculating reasonable royalties for past infringement has attracted widespread academic attention. See, e.g., Golden, Patent Trolls, supra note 235, at 2116–17 (“Given courts’ difficulties with assessing reasonable royalties, there remains a strong argument for a rebuttable presumption of injunctive relief in all cases where infringement has been proven and there is a significant threat that it will continue or resume.”). See generally Anthony T. Kronman, Specific Performance, 35 U. Chi. L. Rev. 351, 360 (1978) (noting that “it would be very difficult and expensive for a court to acquire the information necessary” to tailor damages exactly to the harm suffered by a plaintiff). Such difficulty is compounded by the fact that juries rather than judges ordinarily calculate reasonable royalties. The highly factual nature of such determinations, as well as the frequent absence of detailed accounts of calculations, can render them difficult to review, either on a motion for judgment as a matter of law (JMOL) or on appeal. Daralyn J. Durie & Mark A. Lemley, A Structured Approach to
use of a holistic standard instead of a bright line rule equating infringement with injunctions tends to complicate patent adjudication. However, recent patent jurisprudence dealing with both injunctions and royalties suggests that courts possess the tools and acumen to apply the accession insight.

First, as noted above, courts applying eBay have already gained experience in weighing the relative values of differing technical contributions to an infringing technology. This practice arises from Justice Kennedy’s (nonbinding) guidance that courts should consider whether a patented invention is merely one component of a larger system when determining the appropriateness of injunctive relief. While accession involves an analytically distinct concern—weighing the relative value of an improved species relative to a claimed genus—comparative valuations are already part and parcel of the eBay analysis.

In a broader sense, while I share Newman’s concern over relative valuations, they need not unduly limit applications of accession. When a pioneer patentee does not nonexclusively license an invention, valuing that invention is indeed difficult. However, even where precise valuations are not available, other proxies may inform the comparative valuation analysis. Where a product derives a significant share of its value from a single patented invention, attributes of the product—such as price, profit, and market share—may be useful proxies for valuing the underlying technologies. For example, comparing these metrics between diodes and triodes, or between traditionally purified EPO and recombinant EPO, can provide useful indications of the relative value of an improved technology over a basic patented invention. In an indirect fashion, an improvement’s technical advance over a basic patent may also inform an analysis of its marginal economic value. For example, in Amgen, Inc. v. Chugai Pharmaceutical Co., Amgen’s ability to produce EPO from recombinant DNA greatly enhanced its ability to serve the patient market for this hormone. It bears emphasizing as well that accession

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Calculating Reasonable Royalties, 14 LEWIS & CLARK L. REV. 627, 632 (2010). As we will see, however, courts are becoming more sophisticated in reviewing reasonable royalty determinations. See infra notes 366–372 and accompanying text. Furthermore, additional tools are available to courts to determine ongoing royalties for prospective infringement. See infra notes 373–376 and accompanying text.

351. Peter Lee, Patent Law and the Two Cultures, 120 YALE L.J. 2, 62–63 (2010). In a tautological sense, the difficulties of calculating damages are reflected in the eBay standard itself: the fact that damages are difficult to quantify is a factor that weighs in favor of simply granting an injunction. Id. at 58.

352. See supra Section IV.B.


355. See supra Section IV.A. Of course, this analysis would be complicated by other factors—such as marketing prowess—that may also affect price, profit, and market share. See Golden, Remedies, supra note 32, at 536.

should only apply where the value of some improvement is substantial relative to the value of the patent on which it improves. This will most likely be apparent for "transformative" improvements that change the nature of some patented technology. In "close calls," however, courts would be free to conclude that the equities favored traditional property-rule protection of the pioneer patent.

Second, longstanding and recent case law concerning reasonable royalty determinations can guide more accurate calculations of ongoing royalties. It is important to note in this context that reasonable royalties for past infringement differ from ongoing royalties for prospective infringement. For example, reasonable royalties represent "damages" that typically are subject to jury determination under the Seventh Amendment. However, the Federal Circuit has indicated that ongoing royalties do not necessarily constitute "damages" that must be determined by juries. Notwithstanding these differences, as a normative matter, commentators have argued that similar principles should inform royalty determinations for both past and prospective infringement. As a practical matter, courts are likely to turn to the familiar practice of calculating reasonable royalties for past infringement when determining ongoing royalties.

Along these lines, several longstanding features of reasonable royalty jurisprudence facilitate application of the accession rule. The guiding standard for calculating reasonable royalties arises from *Georgia-Pacific Corp. v. United States Plywood Corp.*, which establishes a fifteen-factor test for determining appropriate compensation for past infringement. Factor thirteen instructs courts to consider "[t]he portion of the realizable profit that should be credited to the invention as distinguished from non-patented elements, the manufacturing process, business risks, or significant features or improvement."

This test has received a fair share of criticism, and the Federal Circuit has observed that "determining a fair and reasonable royalty is often ... a difficult judicial chore, seeming often to involve more the talents of a conjurer than those of a judge." Fromson v. W. Litho Plate & Supply Co., 853 F.2d 1568, 1574 (Fed. Cir. 1988); cf. Golden, *Patent Trolls*, supra note 229, at 2150-51 (describing the difficulties courts have faced when calculating prospective reasonable royalties under *Georgia-Pacific*). In light of these difficulties, commentators have proposed improvements to reasonable royalty determinations that promise to enhance the accuracy of both past and prospective royalty calculations. See, e.g., Durie & Lemley, supra note 350, at 629 (distilling the *Georgia-Pacific* test to three central inquiries).
provements added by the infringer." Thus, established reasonable royalty precedent already reflects the notion of proportional compensation that lies at the heart of the accession insight. In addition to this substantive compatibility, procedural aspects of reasonable royalty calculations enhance the feasibility of applying accession. Under existing case law, patentees bear the burden of establishing damages, thus relieving courts of the responsibility of calculating royalties on a blank slate. This practice of relying on litigants for informational inputs can also ease the calculation of ongoing royalties.

Turning to recent developments, decisions by the Federal Circuit over the past several years have enhanced the analytical rigor with which courts determine reasonable royalties. For example, in ResQNet.com, Inc. v. Lansa, Inc., the Federal Circuit reversed the district court’s award of royalties for both past and ongoing infringement. The Federal Circuit first articulated the general rule that “the trial court must carefully tie proof of damages to the claimed invention’s footprint in the marketplace.” The court then rejected the reasonable royalty calculation submitted by the patentee’s expert in the proceeding below, noting that the expert “used licenses with no relationship to the claimed invention to drive the royalty rate up to unjustified double-digit levels.”

Similarly, in Lucent Technologies, Inc. v. Gateway, Inc., the Federal Circuit rejected the patentee’s proffered licenses because “some of the license agreements [were] radically different from the hypothetical agreement under consideration.” Furthermore, in Uniloc USA, Inc. v. Microsoft Corp., the Federal Circuit rejected a “25 percent rule of thumb” as a baseline for determining reasonable royalties as “fundamentally flawed” and “arbitrary.” Together, these decisions promise greater scrutiny of reasonable royalty calculations and more accurate valuations of infringed patents. Again, while calculating reasonable royalties for past infringement differs from doing so

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364. Cf. Durie & Lemley, supra note 350, at 637 (“[A] reasonable royalty designed to mimic the results of a hypothetical license negotiation between patentee and infringer should be strongly influenced by the value that the patented technology actually contributes.”). Tellingly, proportionality analysis has informed recent congressional proposals to reform the law of patent infringement damages. See, e.g., H.R. 1908, 110th Cong., sec. 5(b)(2) (2007) (stating that courts must ensure that royalties are “applied only to that economic value properly attributable to the patent’s specific contribution over the prior art”).
367. 594 F.3d 860 (Fed. Cir. 2010) (per curiam).
368. ResQNet.com, 594 F.3d at 869.
369. Id. at 869–70. In general, relying on experts for valuations presents a challenge because of the confidential nature of licensing agreements that often inform their calculations. See Lemley & Shapiro, supra note 47, at 2022–23.
370. 580 F.3d at 1327.
371. 632 F.3d 1292, 1315, 1318 (Fed. Cir. 2011).
for prospective infringement, courts are likely to rely on the former when engaging in the latter. Greater sophistication in determining reasonable royalties will help courts calculate appropriate ongoing compensation upon denial of injunctive relief. Notably, the Federal Circuit has already extended these principles to apply greater scrutiny to the calculation of ongoing royalties.372

Moving beyond the realm of reasonable royalties, additional tools are available to courts to determine ongoing royalties. While a jury's determination of a reasonable royalty may provide helpful guidance, the Federal Circuit has held that courts are not bound by the jury's award in setting an ongoing royalty.373 For example, the proportional contribution of a pioneer patent to the value of an improved technology may change over time, rendering the reasonable royalty for past infringement an imperfect measure of compensation for prospective infringement.374 Accordingly, courts may deviate from jury findings when determining an ongoing royalty.375 Along these lines, courts may consider additional evidence "to account for any additional economic factors arising from the imposition of an ongoing royalty."376

Of course, valuation is complicated by the fact that patented inventions, and their improvements, are typically not fungible commodities traded on robust markets.377 However, legal damages aim for a reasonable royalty,378 not absolute precision, and similar principles should inform prospective compensation. If an injunction is denied in a particular case, the patentee, who generally bears the burden of establishing compensable harm, has ample motivation to provide the requisite analysis to justify a particular royalty.379 Ultimately, the greater scrutiny that courts now apply to royalty calculations promises more accurate valuations. To be sure, this proposal will apply more easily to some factual scenarios than others. In complex systems composed of many patented components (e.g., semiconductors), it may be prohibitively difficult to ascertain the relative value of some "im-

372. See, e.g., Paice II, 504 F.3d 1293, 1315 (Fed. Cir. 2007) (reversing and remanding a district court's ongoing royalty calculation because of inadequate support).
375. See Paice II, 504 F.3d at 1317 (Rader, J., concurring) ("[P]re-suit and post-judgment acts of infringement are distinct, and may warrant different royalty rates given the change in the parties' legal relationship and other factors.").
376. Id. at 1315 (majority opinion). For additional flexibility, courts may also reserve the authority to periodically recalculate the royalty rate based on updated information and valuations. See Carlton, supra note 374, at 572.
377. See supra note 349 and accompanying text.
379. Additionally, as a theoretical matter, untailored damages may have surprisingly salutary effects in reducing at least one type of transaction cost—information costs—in negotiations between litigants. See supra notes 318–319 and accompanying text.
provement” compared to one or several patented inputs.\textsuperscript{380} For a subset of cases in which calculating royalties is feasible, however, this proposal to apply accession doctrine holds significant promise.

3. Increasing Incentives to Infringe for Improvers

Critics may also argue that any rule that rewards (or decreases costs for) infringers will encourage more infringement. In doing so, critics might note the oft-cited public interest in maintaining respect for patents by enforcing strict rights to exclude.\textsuperscript{381} Improvers, motivated by strategic considerations, may simply elect to infringe patents rather than seek licenses, content in the expectation that they would only face an ongoing royalty rather than an injunction upon a finding of infringement. Here again, however, criticisms are overstated.

First, the accession rule’s high standard of “substantial improvement” significantly constrains the universe of infringers eligible to benefit from accession considerations. This high standard would screen out minor improvers from potential liability-rule treatment. Accession would be a rare intervention reserved for substantial technical and economic improvements over some basic patented invention.

Second, as noted above, willful infringement doctrine can discipline the behavior of the subset of improving infringers who act with “objective recklessness” with respect to an existing patent.\textsuperscript{382} Under current law, such infringers could face up to treble damages for past infringement.\textsuperscript{383} While not all improving infringers will qualify as willful infringers, the prospect of enhanced damages provides a strong incentive for parties unsure of their status to negotiate a license with a patentee.

Third, and more broadly, some types of infringement are simply not as socially harmful as others. The incentive-producing, investment-protecting rationale for strict exclusive rights is strongest in cases of direct copying,\textsuperscript{384} when one entity completely free rides on the inventive efforts of another. However, substantial improvement of an existing technology represents a different kind of infringement. Here, the costs to the patentee and incentives to invent more generally must be weighed against the significant social gains from accelerating the introduction of a substantially improved


\textsuperscript{381} See, e.g., Patlex Corp. v. Mossinghoff, 758 F.2d 594, 599 (Fed. Cir. 1985) (noting that the “encouragement of investment-based risk is the fundamental purpose of the patent grant, and is based directly on the right to exclude”).

\textsuperscript{382} In re Seagate Tech., LLC, 497 F.3d 1360, 1371 (Fed. Cir. 2007) (en banc). See supra notes 226–229 and accompanying text.


\textsuperscript{384} Of course, a patent regime cannot limit itself to only prohibiting exact imitation, for “the unscrupulous copyist” would “make unimportant and insubstantial changes and substitutions in the patent which, though adding nothing, would be enough to take the copied matter outside the claim.” Graver Tank & Mfg. Co. v. Linde Air Prods. Co., 339 U.S. 605, 607 (1950).
technology. This is particularly pertinent given that the nature of patent claiming tends to “sweep in” broad parcels of technological territory beyond what a pioneer inventor may have actually created. As a rough social calculus, efficiency interests may justify relaxing traditional property-rule protection of patents in order to encourage the development and dissemination of substantial improvements.

4. Decreasing Incentives to Invent for Pioneers

This proposal may impact incentives not only for improvers but also for pioneers. In particular, critics might contend that liability-rule protection of patents would diminish initial incentives to invent. Along these lines, commentators note that liability rules typically undercompensate property owners. Among other considerations, such valuations do not capture idiosyncratic value, consequential losses, and value gaps between the best-known uses of a resource and the best publicly verifiable uses of that resource. This gap between private and court-determined valuations may chill initial incentives to invent.

However, several considerations suggest that this critique may be overstated. First, although strategic value based on the threat of holdup may enhance incentives to invent, it is far from clear that this is the type of value that the patent system should endeavor to compensate. Second, and more generally, the chain of events and probabilities necessary to reach liability-rule protection of a patent is rather long and tenuous. The relatively low

385. See supra Section I.A.

386. Merges, Blocking Patents, supra note 56, at 101–02 (“Any scholar who writes on intellectual property rights and who advocates that some rights should be scaled back can anticipate the criticism that incentives will be harmed.”).

387. See Cotter, supra note 71, at 1164–65 (describing the argument that reasonable royalty compensation creates a situation in which “it is the downstream users who are in effect holding up the patentee for a share of the surplus, and in so doing are discouraging socially optimal investments upstream”).


389. Newman, Patent Infringement, supra note 17, at 79–82; see Smith, Property and Property Rules, supra note 84, at 1763–64 (noting that property rules allow owners to “bet” on potential value increases in the future, as compared with liability rules, which involve immediate valuation of an asset). In addition to undercompensating property owners, liability rules also impose substantial administrative costs on the public body that must apply them. Newman, Patent Infringement, supra note 17, at 81–82.

390. See eBay Inc. v. MercExchange L.L.C., 547 U.S. 388, 396–97 (2006) (Kennedy, J., concurring) (noting that the threat of an injunction can create leverage that leads to “exorbitant” licensing fees); see also Golden, Patent Trolls, supra note 235, at 2139–40 (suggesting that rewarding “holdout” value is a cost against which the traditional benefits of injunctive relief should be weighed); Shapiro, supra note 71, at 303 (arguing that the patent system should compensate patentees by means other than “inefficiently enabling patent hold-up”).
likelihood that some future infringement would result in liability-rule protection of a patent would tend to dampen chilling effects on patentees' initial incentives to invent. Third, this proposal is best understood not as displacing private ordering, but as changing the baseline conditions against which negotiations take place. Private parties would still have ample opportunities to negotiate a mutually beneficial agreement.

Even if a court imposes an ongoing royalty, it is not clear that such compensation would detrimentally impact incentives to invent. Empirical evidence from the pharmaceutical industry suggests that one form of liability-rule protection—compulsory licensing—does not diminish innovation. Additionally, compulsory licenses have existed for decades in certain copyright contexts, with little empirical evidence of chilling effects on creative productivity. Relatedly, between a world in which no licensing agreement arises and one in which a patentee obtains court-determined ongoing royalties, the patentee may be better off in the latter. The gains from court-ordered royalties may be particularly pronounced if, as Robert Merges suggests, the pioneer technology can maintain a robust market position as a low-cost alternative to the improvement.

Finally, rather than characterizing this proposal as decreasing incentives to invent, it may be more accurate to say that it creates an additional incentive for pioneer patentees to continue working on and improving their inventions. After all, if a pioneer patentee practices the same improved technology as an infringer, an injunction will typically be forthcoming.

391. Cf. Merges, Blocking Patents, supra note 56, at 102-03 (suggesting that because of various contingencies, liability-rule protection of patents is unlikely to significantly impact incentives to invent). It bears emphasizing that, for most factual predicates, patentees would continue to obtain property-rule protection of their patents. Thus, the investment-dampening effect of this proposal is somewhat intermediate between that of a pure property-rule regime and a pure liability-rule regime, which is characteristic of so-called pliability rules. See Bell & Parchomovsky, supra note 202, at 27.

392. This is not to suggest that such agreements would necessarily be optimal for either party. In particular, John Golden observes that “information asymmetries appear most likely to disfavor the patent holder in negotiations, suggesting that regardless of any inherent skill at bargaining, the patent holder will probably be substantially handicapped in its ability to achieve an especially favorable negotiated result.” Golden, Patent Trolls, supra note 235, at 2133. Furthermore, there is a concern that court-ordered damage awards will function as a ceiling on valuations that will bias negotiated settlements downward. Moreover, if court-ordered awards are based on negotiated settlements (and vice versa), this downward bias may expand over time. Golden, Remedies, supra note 32, at 568–69. To the extent that courts are aware of these biases, however, they may attempt to counteract them with more searching analyses of the comparable licensing agreements used as the basis for determining ongoing royalties.


395. Merges, Blocking Patents, supra note 56, at 79–80. In this case, the extra royalty stream from the improvement may be “pure gravy” to the pioneer patentee. Id. at 80.

396. See supra notes 292–294 and accompanying text.
VI. THEORETICAL IMPLICATIONS

In addition to pragmatically reforming patent law’s treatment of technological improvement, this proposal to apply the accession insight in patent remedies analysis also holds several implications for patent law and theory.

A. Adapting the Principles of the Reverse Doctrine of Equivalents

Close observers of patent law will recognize that this proposal represents a subtle but significant variation on the reverse doctrine of equivalents. As noted above, under the reverse doctrine of equivalents:

[W]here a device is so far changed in principle from a patented article that it performs the same or a similar function in a substantially different way, but nevertheless falls within the literal words of the claim, the doctrine of equivalents may be used [in reverse] to restrict the claim and defeat the patentee’s action for infringement.\(^\text{397}\)

In theory, the reverse doctrine of equivalents operates as a safety valve to excuse a radical improvement from liability even though it technically infringes the claims of an existing patent.\(^\text{398}\) As we have seen, however, the Federal Circuit has essentially declared it a moribund doctrine.\(^\text{399}\)

However, this proposal to apply accession doctrine in remedies analysis captures much of the insight of the reverse doctrine of equivalents. Recall that in its starkest formulation, accession doctrine shifts title to some improved item when the improver has transformed the item into a different "species,"\(^\text{400}\) as when an improver transforms standing trees to barrel hoops. In this situation, return of the original property is literally impossible because its identity has fundamentally changed. Similarly, transformation is critical to classic descriptions of the reverse doctrine of equivalents. In *Boyden Power-Brake Co. v. Westinghouse*, the Supreme Court noted:

[I]f the [defendant] has so far changed the principle of the device that the claims of the patent, literally construed, have ceased to represent his actual invention, he is as little subject to be adjudged an infringer as one who has violated the letter of a statute has to be convicted, when he has done nothing in conflict with its spirit and intent.\(^\text{401}\)


\(^{398}\). See supra notes 56–65 and accompanying text.

\(^{399}\). See supra note 78.

\(^{400}\). See supra note 131 and accompanying text.

\(^{401}\). 170 U.S. 537, 568 (1898) (emphasis added); see also Del Mar Avionics, Inc. v. Quinton Instrument Co., 836 F.2d 1320, 1325 (Fed. Cir. 1987) (observing that the reverse doctrine of equivalents applies where the accused device, though literally infringing, “has been so changed that it is no longer the same invention”); SRI Int’l v. Matsushita Elec. Corp. of Am., 775 F.2d 1107, 1124 (Fed. Cir. 1985) (noting that the reverse doctrine of equivalents inquires “into whether a product has been so far changed in principle that it performs the same or similar function in a substantially different way”).
While technically one could still subject the transformed invention to the full exclusive rights of the underlying patent, equity weighs against doing so. Thus, in both the accession and reverse doctrine of equivalents contexts, an infringer's radical transformation of some existing (intellectual) property justifies mitigating liability.\(^4\)

The key difference lies in the extent to which these approaches mitigate liability. Under the reverse doctrine of equivalents, a party completely avoids liability and concomitantly bears no obligation to compensate the patentee for continuing to practice his technology. Under the current proposal, however, considerations similar to the reverse doctrine of equivalents would convert patent protection from a property rule to a liability rule. Accordingly, the improver would be liable for patent infringement and must compensate the pioneer.

Considering “radical transformation” at the remedies stage rather than at the liability stage may mitigate the harshness of the reverse doctrine of equivalents. It bears emphasizing that this proposal does not intend to replace the reverse doctrine of equivalents, which in theory plays an important role in limiting patent rights. However, given that the doctrine exists more in principle than in practice, the current proposal makes mitigating liability based on transformative infringement more palatable for courts. The drastic nature of the reverse doctrine of equivalents—which completely relieves a party of any liability (and remedy) for literal infringement—likely contributes to courts’ reluctance to apply it. In addition, liability-rule protection may be particularly appropriate for improvements that demonstrate a substantial degree of transformation yet do not meet the threshold for the reverse doctrine of equivalents. In essence, the accession rule offers courts a middle zone of flexibility between the poles of no infringement liability and full property-rule protection of an infringed patent. Given the intermediate nature of liability-rule protection, courts may be emboldened to actually inquire into the relative contributions of a pioneer and improving inventor when determining appropriate infringement remedies.

B. Patents as Property Revisited

While this Article offers a practical proposal to enhance patent law’s treatment of technological improvement, it also sheds light on the broader relationship between patents and property. As noted above, many have criticized comparisons of patents and property by highlighting the fundamentally different kinds of subject matter falling within these domains. Patents cover nonrival, intangible technical designs, while property law covers rivalrous, tangible resources. Given the nonrival nature of patented inventions, moreover, common justifications for strict exclusive rights—such as averting a tragedy of the commons—lose significant force.\(^4\)

\(^4\) See Parchomovsky & Stein, supra note 16, at 1528 (drawing an analogy between “expressive accession” in copyright and the reverse doctrine of equivalents in patent law).

\(^4\) See supra Section II.A.
However, this Article highlights a central irony: accession—a property doctrine—is arguably more appropriate for patents than for physical property. In the tangible property context, accession results in physical dispossession of some improved item from its “original” owner. Given the nonrival nature of patented inventions, however, the pioneer patentee who is subject to the accession rule does not physically lose anything. To be sure, she may lose some expectation value from her patent, but she can still make much productive use of her invention (as opposed to the landowner who loses his wood to the mistaken improver). In some sense, therefore, the nonrival nature of intellectual property provides opportunities for shared access and simultaneous exploitation that physical property does not.

Social welfare concerns also render patents even more amenable to accession than physical property. Among the several rationales informing accession is protecting productive effort. George Wetherbee, for example, productively transformed $25 worth of trees into approximately $700 worth of barrel hoops. While his contribution to social welfare may have been significant, it is likely dwarfed by introducing substantially improved technologies to the marketplace. Encouraging the development of ingenious new train brakes, revolutionary triodes as opposed to diodes, and a host of other technological improvements promises significant social benefits. While chilling effects on pioneer patentees must be taken into account, accession doctrine can help accelerate the development and dissemination of such improvements. Ultimately, in the accession context, patents may be even better suited to property doctrine than property itself.

**CONCLUSION**

In the physical realm, unauthorized improvement of someone else’s property may result in title shifting to the improver, contingent upon compensating the original owner for the value of the underlying materials. This Article argues that recent developments in the law of patent infringement remedies suggest that this insight should be adapted to the intellectual property realm as well. In particular, it proposes applying accession doctrine—with some modification—to deny injunctive relief when an infringer substantially improves on an underlying patented invention. When the infringing technology represents a substantial technical and economic advance that dominates the value of the underlying patent, equity weighs against strict enforcement of the pioneer’s right to exclude and in favor of compelling the improver to compensate the pioneer for the market value of her patented invention. While physical property accession insists that defendants act in good faith, the unique characters of patent

404.  See supra Section IV.A.1; Richard A. Posner, Misappropriation: A Dirge, 40 Hous. L. Rev. 621, 622 (2003); cf. Parchomovsky & Stein, supra note 16, at 1527 (“An author who borrows from another’s work to create an exceptionally creative work of her own does not appropriate the copied work in the traditional property sense.”).

law and the eBay framework, as well as the availability of other safeguards, counsel against importing such a requirement into the patent realm.

This proposal would ameliorate the deficiencies of the current blocking patents regime as well as the reverse doctrine of equivalents. Regarding blocking patents, the prospect of property-rule protection by a pioneer patentee may frustrate negotiations or result in skewed distributions of rents that diminish incentives to improve. While the reverse doctrine of equivalents exists in theory to relieve liability where a literally infringing invention operates in a radically different manner, courts rarely invoke it. The current proposal for liability-rule protection in the context of substantial technological improvement would both rationalize the balance of power in blocking patents scenarios as well as render the principles of the reverse doctrine of equivalents more palatable to courts and patentees alike.

By extending liability-rule protection to pioneer patents in appropriate contexts, this approach promises to enhance patent law's treatment of technological improvement. While liability rules give rise to concerns over third-party valuations of technological assets, a liability-rule regime may be fully consistent with direct negotiations between patentees and prospective licensees and the related efficiency gains of private ordering. And even when a court must step in to enforce a liability rule, recent jurisprudence relating to injunctions and damages provides useful guidance for applying the accession insight. In a broader sense, patents may be particularly well-suited to accession given the nonrival nature of technology; an improving infringer who avails herself of the accession rule does not physically dispossess the patentee of anything. While patents and property diverge in many ways, accession is one area in which patent law can benefit substantially from the insights of traditional property law.