Taming the Doctrine of Equivalents in Light of Patent Failure

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TAMING THE DOCTRINE OF EQUIVALENTS IN LIGHT OF PATENT FAILURE

Samson Vermont*

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I. INTRODUCTION

If the notice provided by patents were twice as clear as it is, it would still be half as clear as it needs to be. This, loosely speaking, is the upshot of Patent Failure, a book that should inspire bigger changes in patent law than did the birth in 1982 of the Court of Appeals for the Federal Circuit.

The authors, Jim Bessen and Michael Meurer, find that patents in fields outside chemistry and pharmaceuticals (chem-pharma) currently discourage innovation overall. More specifically, the authors find that, outside chem-pharma, innovators' patent litigation costs are four times higher than their patent profits, which implies, when combined with other findings, that the patent system actually taxes innovation outside chem-pharma. Outside chem-pharma,


2 Bessen & Meurer, supra note 1, at 96–146.

3 Accused infringers tend to spend more on research and development (R&D) than do the patentees who sue them. This implies that the more a firm spends on R&D, the more likely that firm is to be sued for infringement. Bessen & Meurer, supra note 1, at 123–26; James Bessen & Michael J. Meurer, Patent Litigation with Endogenous Disputes, 96 Am. Econ. Rev. 77, 80 (2006); James Bessen & Michael J. Meurer, The Patent Litigation Explosion (Boston Univ. Sch. of Law Working Paper No. 05-18, 2005), available at http://ssrn.com/abstract=831685. Furthermore, the vast majority of accused infringers are not pirates. Outside pharmaceuticals, in less than one-half of one percent of reported opinions does the court hold that the accused infringer actually copied the invention. Christopher A. Cotropia & Mark A. Lemley, Copying in Patent Law 24, 37 (Stanford Pub. Law Working Paper No. 120160, 2008), available at http://ssrn.com/abstract=1270160. See also Bessen & Meurer, supra note 1, at 126 (estimating that in about four percent of cases infringers are held liable for enhanced damages for intentional copying). Indeed, in less than one percent of non-pharmaceutical cases does the patentee allege that the infringer copied the patented invention, even though it is in the interests of a patentee to allege copying if the infringer in fact copied. Cotropia & Lemley, supra, at 20, 24–26.

patent litigation costs tend to be high because the products tend to include many interrelated components and are thus covered by a patchwork of diverse patents, many of uncertain scope. Similarly, profits per patent tend to be low outside chem-pharma, where profits must be divided up among the patchwork.

*Patent Failure* is a clarion call for myriad reforms. The first order of business should be to change the current judicial standard for indefiniteness from "insolubly ambiguous" to something along the lines of "not particular and distinct." Reform of continuation applications should also rank high on the agenda. Reform of the doctrine of equivalents, the subject of this Article, should also rank high. When courts find a patent infringed, they usually find it literally infringed. In only about one of every four or five cases in which a patentee wins a judgment of infringement is it a judgment of infringement under the doctrine of equivalents (DOE). This statistic implies that most patent rents (profits) are provided by the literal scope of patent claims. Yet, DOE scope is litigated frequently. One of every two decisions on infringement is a decision on DOE infringement. Furthermore, the DOE is relevant at some point in time in all actual and potential patent disputes other than those in which either literal infringement or invalidity is a slam dunk from the outset.

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5 Bessen & Meurer, *supra* note 1, at 14.


7 The Patent Act already requires that patents conclude with one or more claims particularly pointing out and distinctly claiming the invention. 35 U.S.C. § 112(2) (2000).

8 Applicants use continuations to sit and wait to see what competitors do. Applicants then amend the pending claims accordingly. The notice costs generated by continuations appear to be high enough to justify restricting, if not eliminating, them altogether. See Mark A. Lemley & Kimberly A. Moore, *Ending Abuse of Patent Continuations*, 84 B.U.L. REV. 63, 105-17 (2004) (arguing for reform of continuations). A possible alternative to eliminating continuations would be to allow them but not give them DOE protection, i.e., to reserve DOE protection for claims of the original application.

9 This observation is based on the numbers reported in the PatStats Database. Univ. of Houston Law Ctr., Decisions for 2000-2004, http://www.patstats.org/Patsstats2.html (last visited Oct. 13, 2008) (stating 244 of 383 of infringement cases in favor of patentee based on literal direct infringement). From 2000 to 2006, United States courts issued 1,283 decisions on literal infringement and 687 decisions on DOE infringement. See Univ. of Houston Law Ctr., PatStats.org, http://www.patstats.org/Patsstats2.html (follow hyperlinks for “Composite Table for 2000–2004,” “2005,” and “2006”) (last visited Oct. 13, 2008) (providing data on infringement decisions based on description and results). Of the 1,283 decisions on literal infringement, twenty-nine percent were in favor of the patentee; seventy-one percent were in favor of the accused infringer. *Id*. Of the 687 decisions on DOE infringement, fifteen percent were in favor of the patentee; eighty-five percent were in favor of the accused infringer. *Id*.

10 *Id*.

11 *Id*.
Given that literal scope provides most of the incentives that patents provide, given also that DOE scope is litigated disproportionately often, and given further that the DOE is relevant in most cases, the DOE appears to generate high notice costs for every incremental incentive that it provides. The DOE appears to provide a modest minority of the patent rents while generating a large minority, if not a majority, of the notice costs.

Part II of this Article explains why we should not abolish the DOE, at least not without first attempting reform. The DOE provides several social benefits. Indeed, within a narrow range, the DOE even has a tendency to improve patent notice. And, as discussed in Part II, there is no good substitute for the DOE.

Part III proposes that we soften the penalty for DOE infringement by staying permanent injunctions against DOE infringement. For DOE infringement, the courts should always stay injunctions for a modest period of time (e.g., one year). The stay should be long enough that, in most cases, the patentee’s bargaining power in settlement negotiations remains strong only if the invention is technologically significant. That is, we want the patentee’s bargaining power to rest more on the substantive merit of his invention and less on his ability to exploit the fact that the infringer will have to shut down operations to switch out the invention.

Part IV proposes that we treat equivalents under 35 U.S.C. § 112(6) the same way that we treat equivalents under the DOE. Under current law, we have a separate jurisprudence for § 112(6) equivalents that complicates the doctrine without fine-tuning patent scope in a meaningful or salutary way. Dropping the pointless distinctions between DOE equivalents and § 112(6) equivalents will remove some unnecessary complexity from the law without affecting the magnitude of equivalents protection.

Part V reassesses the rationales for the doctrine of prosecution history estoppel and offers thoughts on the issue of whether, in light of Patent Failure, the absolute bar of Festo I\(^2\) beats the flexible bar of Festo II.\(^3\)

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\(^2\) Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co. (Festo I), 172 F.3d 1361 (Fed. Cir. 1999) (barring all equivalents for a limitation narrowed for any reason related to patentability).

\(^3\) Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co. (Festo II), 535 U.S. 722 (2002) (adopting a flexible bar against equivalents whereby the range of the bar is keyed to the reason for the amendment).
II. THE COSTS AND BENEFITS OF THE DOE

A. THE COSTS OF THE DOE

The DOE throws a wrench into the analysis of whether an activity infringes a patent. To exaggerate a bit, the DOE converts the question of infringement from a binary question of identity ("is it the same?") to a relative question of similarity ("is it close enough?"). Consider the following famous cases.

In Winans v. Denmead, the patentee claimed a coal car with a downward tapering body shaped like a "frustum of a cone." The accused infringer made a coal car with a downward tapering body shaped like an upside-down octagonal pyramid, which was eight-sided rather than round in the horizontal plane. The accused car did not literally infringe. Was it equivalent? Was an eight-sided car equivalent to a cone-shaped car for purposes of patent infringement? What if the accused car were five-sided? What if it were 100-sided?

In Graver Tank & Manufacturing Co. v. Linde Air Products, the patentee claimed a welding composition "containing a major proportion of alkaline earth metal silicate." The accused infringer used a silicate of manganese, which is a transition metal and not one of the six alkaline earth metals. Clearly, the accused composition did not literally infringe. For purposes of welding, however, the
accused composition worked as well as the claimed composition.20 Also, the specification referred to silicates of manganese in a way that made them seem equivalent to silicates of certain alkaline earth metals.21 So, is the accused composition equivalent to the claimed composition?22

In *Corning Glass Works v. Sumitomo Electric*, the patentee claimed an optical fiber comprising a glass coating around a glass core, the core including a positive dopant that raised the core’s refractive index above the coating’s refractive index.23 The fiber of the accused infringer had the converse: A negative dopant in the coating that lowered the coating’s refractive index below the core’s.24 Clearly, the accused fiber did not literally infringe. Was it equivalent to the claimed fiber?25

In *Warner-Jenkinson Co. v. Hilton Davis Chemical Co.*, the patentee claimed a filtration process performed "at a pH from approximately 6.0 to 9.0."26 The accused infringer’s filtration process performed at a pH of 5.0.27 The accused process did not literally infringe. Was it equivalent? Was a pH of 5.0 equivalent to a pH of “approximately 6.0” in the context of this technology?28

In *Festo II*, the patentee claimed a device having two sealing rings each with one lip.29 The accused infringer’s device had one seal with a two-way lip.30 The

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20. *Id.*


24. *Id.* at 1259.

25. The Federal Circuit thought so. Although Sumitomo’s core included no positive dopant, the court denied violating the all-limitations rule. *Id.* at 1259. The rule requires, wrote the court, that the claimed limitations (or their equivalents) appear in the accused device. *Id.* The rule does not necessarily require that the limitations appear in the same corresponding “component” of the accused device. Sometimes limitations can be transported to non-corresponding components of the accused device without destroying equivalence. *Id.* The court did not explain how a component differs from a limitation, when limitations can be transported, or how a limitation could both be transported and changed in sign (from positive to negative) and still satisfy the all-limitations rule.


27. *Id.* at 729.

28. The Court thought so. *Id.*


30. *Id.* at 729.
accused device did not literally infringe. Was one seal with a two-way lip equivalent to two sealing rings each with one lip?31

In Johnson & Johnston Associates v. R.E. Service Co., the patentee claimed a component, for use in printed circuit boards, comprising “a laminate constructed of a sheet of copper foil . . . and a sheet of aluminum . . . .”32 The accused component employed a steel sheet rather than an aluminum sheet.33 Clearly the accused component did not literally infringe. However, the specification stated that “[w]hile aluminum is currently the preferred material for the substrate, other metals, such as stainless steel or nickel alloys, may be used.”34 Was the accused steel sheet equivalent to the claimed aluminum sheet?35

As these cases demonstrate, the DOE makes it hard to know what technology is owned and who owns it.36 This uncertainty generates direct and indirect notice costs. The direct notice costs—or transaction costs—include the costs of determining that a patent search is warranted, finding the relevant patents and their owners, assessing infringement and validity, negotiating licenses, and litigating. The indirect notice costs come in the form of decreased incentives to innovate and the ensuing loss to society of innovations that would have been made but for the decreased incentives.37 The DOE can decrease incentives to innovate because it increases the risk of patent infringement as well as the reward of patent protection. The DOE increases both the chance that the inventor’s product will be covered by someone else’s patent and the chance that the inventor’s patent will cover somebody else’s product.

There is a point beyond which the DOE degrades notice so much that the DOE decreases incentives to innovate more than it increases them. That is, at some point the DOE blurs notice so much that it increases an inventor’s expected downside from infringing somebody else’s patent more than it increases the inventor’s expected upside from somebody else infringing the inventor’s

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31 The Court thought so, although it remanded the case for a determination of whether the doctrine of prosecution history estoppel barred recovery under the DOE. Id. at 722, 741–42.
33 Id.
34 Id. at 1066 (emphasis added).
35 Steel may be technologically equivalent, but the Federal Circuit held that by disclosing but never claiming steel, the patentee dedicated the use of steel to the public. Id. at 1055. Thus, steel was not legally equivalent to aluminum. Id. The Federal Circuit distinguished Graver Tank by pointing out that Graver Tank’s patent included other claims, claims 24 and 26, that literally encompassed a broad genus of metal silicates, of which manganese silicate is a species. Id. at 1053–54, n.1. Although claims 24 and 26 were invalid over prior art, the existence of the claims showed that the patentee did not dedicate manganese silicate to the public—manganese silicate was not unclaimed. Id.
36 BESSEN & MEURER, supra note 1, at 61–62.
37 Id. at 9.
The inventor's expected downside and expected upside do not merely cancel each other out because patentees and infringers must incur transaction costs to transfer wealth between them, and because inventors are risk-averse and weigh losses more heavily than gains of numerically equal magnitude. 38

B. THE BENEFITS OF THE DOE

Should we abolish the DOE in its entirety and limit all patent infringement to literal infringement? Probably not. 39 The DOE can provide benefits in four ways.

First, the DOE can increase incentives to innovate more than it decreases them. The DOE increases incentives by decreasing the risk that literal scope will fall short and that Jones's patent rents will come in below the costs of creating the invention. The DOE thus resembles insurance: It increases an inventor's incentive to engage in risky activity (inventing) when he knows that he is exposed to a class of risk (the failure of literal scope) but can neither easily predict, nor adopt cheap precautions to obviate, the specific chain of events through which particular risks in the class could materialize.40

The rub is that, from the perspective of another inventor, Smith, Jones's DOE scope resembles a minefield. The DOE scope afforded to Jones's patent increases the risk and uncertainty faced by Smith. Of course, Smith enjoys the security afforded by the DOE to her patent, and others fear the DOE scope afforded to Smith's patent. This tension does not, however, preclude the possibility of the


39 For an ostensibly opposing view, see Joshua D. Sarnoff, Abolishing the Doctrine of Equivalents and Claiming the Future after Festo, 19 BERKELEY TECH. L.J. 1157 (2004) (“The modern [DOE] lacks theoretical justification, imposes high costs on society, and likely impedes innovation.”). Sarnoff's view is only ostensibly opposing because he distinguishes between the current DOE and a milder doctrine of non-literal claim scope, reserving the rubric "DOE" and his objection for the former. Id. at 1212-15. In contrast, I use the term "DOE" more broadly to refer to all forms of non-literal claim scope.

40 It does not follow from this that the DOE should never rescue patentees from their obvious errors. Obvious errors are not necessarily avoidable with cheap precautions. It is very expensive to always avoid all obvious errors. Failure to look in your rear-view mirror seems like an obvious error, and looking in your rear-view mirror on any given occasion seems like a cheap precaution. But going a lifetime without ever once failing to look in your rear-view mirror is an expensive precaution. See generally Mark Grady, Tort Reform: An Economic Approach, 2 J. FORENSIC ECON. 1, 5-7 (1988) (explaining that for some types of precautions, the most significant cost is the cost of remembering to always take the precaution); Mark Grady, Why Are People Negligent? Technology, Nondurable Precautions, and the Medical Malpractice Explosion, 82 NW. U. L. REV. 293 (1988) (discussing failure to remember to take precautions in context of medical care).
DOE improving incentives overall. Rather, this tension speaks to the need for a balance in the law of the DOE.

Second, the DOE cuts the costs of drafting claims. The DOE allows the drafter to draft a claim as if the reader of the claim will be at least somewhat cooperative in interpreting its meaning. Absent a cooperative reader—absent assurance that the relevant reader must interpret limitation X as “X and its equivalents”—the drafter will want to replace or supplement a straightforward claim to X with one or more of the following:

- tortuous claims, worded like statutes, that aspire to literally encompass X and its equivalents;
- functional claim language—such as “means of fastening” rather than “shoelace”—that aspires to literally encompass X and its equivalents;
- claim language that literally lists X and all of the individual equivalents of X that the drafter can think up; or
- a multitude of claims each individually reciting X or one of the equivalents of X that the drafter can think up.

The resulting claims would be abstract, legalistic, repetitive, or numerous—in a word, “convoluted.” Convoluted claims, and specifications that support them, are harder to draft. Try, for instance, to draft a claim for Winans using language that literally encompasses minor variants (like the accused eight-sided car) as well as the preferred cone-shaped car—without encompassing the prior art. It is much easier to draft a straightforward claim to a cone-shaped car and rely on the courts to use their equitable powers to cover minor variants. Imagine also the

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41 See, e.g., Joseph S. Cianfrani, Note, An Economic Analysis of the Doctrine of Equivalents, 1 VA. J. L. & TECH. 1, 36 (1997) (stating that DOE allows patentees to obtain scope for which they are entitled without forcing them to spend excessive resources trying to claim that scope literally).


43 Convoluting claims would also encumber the specification. Cf. Craig A. Nard, A Theory of Claim Interpretation, 14 HARV. J. L. & TECH. 1, 69 (2000) (“It would simply be too burdensome and would unduly limit the scope of protection to require a patent applicant to disclose every possible equivalent in the patent application.”).

44 Winans v. Denmead, 56 U.S. 330, 331 (1853) (reproducing Winan’s actual claim).
additional disclosure that the Winans specification would have required to support a claim that literally encompasses minor variants as well as the preferred embodiment. How valuable to the examiner or to a person of skill in the art is this additional disclosure over and above the disclosure of the preferred cone-shaped car? Once a patent discloses an inventive concept and its best incarnation, why should the patent recite a litany of minor variants?

Third, although the DOE probably degrades notice overall, the DOE has at least a partially offsetting tendency to improve notice. Just as the DOE has competing effects on incentives, it has competing effects on notice. When DOE scope hews close to literal scope, DOE scope might even hit a sweet spot where it clarifies claim boundaries more than it blurs them. The DOE can clarify claim boundaries for the same reason that the DOE cuts the costs of claim drafting. Absent assurance that the reader must interpret X as “X and its equivalents,” the drafter will want to include convoluted claims. Convolved claims not only cost more to draft, but also cost more for potential infringers to identify and to interpret. Furthermore, without DOE protection, drafters have greater incentives to draft deliberately ambiguous claims. Ambiguous literal scope is itself a substitute for DOE scope. Ambiguous literal scope gives patentees a shot at molding claim interpretation ex post, especially to cover after-arising technology and technology far outside the field of the patented invention. Ambiguous literal scope is also harder to design around than clear literal scope. If DOE scope is not available to buffer literal scope, drafters have greater incentives to create a buffer of uncertainty around their claims by employing terms whose meanings cannot be pinned down with confidence.

Fourth, the DOE and the doctrine of prosecution history estoppel (PHE) constitute, respectively, a carrot and a stick that together discourage applicants from overreaching during ex parte prosecution. Under PHE, the DOE cannot

45 See supra note 36 and accompanying text.


47 See Risch, supra note 1, at 180–81, 188–89 (discussing ex post gaming that relies on claim ambiguity).

48 See Alan L. Durham, Patent Symmetry, 87 B.U. L. REV. 969, 983–84 (2007) (“[T]here are occasions when claim language is sufficiently clear that competitors of the patentee can ‘design around’ it, confident that what they are doing does not literally infringe. That competitors cannot be equally confident in their freedom from liability is due to the long-established ‘doctrine of equivalents.’”).
cover what a patentee surrendered to obtain the claim. PHE comes into play if, during prosecution, the applicant amends a claim for a reason related to patentability and in so doing narrows the claim in some respect, or if, during prosecution, the applicant argues for a claim interpretation that is narrower in some respect than the claim's broadest reasonable interpretation. PHE deters overreaching by threatening to take away DOE scope from applicants who claim the world and leave the entire burden on the examiner to chisel down the claims to something approaching the true scope of the invention.

In other words, when applicants' words can later be used against them, and when applicants do not know which claim interpretations will later serve their interests, they become more humble and circumspect in their claiming and argument. If applicants could claim and argue whatever they wanted to, with no potential downside for overreaching that falls short of inequitable conduct, patents would become even less reliable records of who owns what technology.

C. THE LACK OF GOOD SUBSTITUTES FOR THE DOE

Alleged substitutes for the DOE include reissue applications, continuation applications, claim amendments, and special techniques for drafting literal claims. Unfortunately, none of these is a good substitute. Under current law, each must be employed by a certain deadline. For example, reissues that broaden claims must be filed within two years after the patent issues. Moreover, even if we removed the deadlines, none of the alleged substitutes would reduce the costs of drafting claims, none discourage the drafting of convoluted claims, and none discourage overreaching during prosecution.

Further, none of the alleged substitutes is as useful as the DOE for capturing after-arising technology (AAT), i.e., technology that does not come into existence until after the patent is filed or issued. Some commentators argue that the substitutes cannot cover AAT because the substitutes require that the revised

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50 See id. at 30–31 (explaining application of PHE)
51 See Lichtman, supra note 46 (listing and rejecting alleged substitutes for the DOE).
53 There appears to be disagreement about whether AAT is technology that arises after the filing date or after the issuance date. Compare In re Hogan, 559 F.2d 595, 605 (1977) (stating that after-arising technology is technology that comes "into existence after the filing date . . . "), with Al-Site Corp. v. VSI Int'l, Inc., 174 F.3d 1308, 1320 (Fed. Cir. 1999) (stating that equivalent structure cannot embrace technology developed after the issuance of the patent because the literal meaning of a claim is fixed upon its issuance). On first pass, the inability of applicants to add new matter to pending applications suggests that the filing date should start the clock for AAT.
literal claims be enabled and described by the application, yet the application cannot enable and describe technology that did not exist when the application was filed.\textsuperscript{54}

These commentators put too little faith in literal claims. Literal claims routinely cover AAT.\textsuperscript{55} Otherwise, blocking patents would be impossible.\textsuperscript{56} It is more accurate to argue that because the substitutes require that the revised literal claims be enabled and described, the substitutes cannot cover as much AAT as the DOE can.

Other commentators argue that applicants do not need the DOE to cover AAT because applicants can use special claim drafting techniques to literally cover AAT.\textsuperscript{57} Specifically, applicants can use generic language (e.g., “light source” instead of “lamp”), terms of degree (e.g., “mostly”), broadening modifiers (e.g., “substantially”), functional limitations, negative limitations (“but not . . .”), and language of result.\textsuperscript{58}

These commentators put too much faith in literal claims. These techniques are no panacea because they tend to broaden claims both forwards to capture the future and backwards to capture the prior art. While these techniques help claims literally encompass AAT, they also increase the odds that claims literally encompass the prior art.

In any event, it is far from evident that we should encourage applicants to employ these techniques. These techniques increase the costs of drafting claims because, again, drafters cannot employ these techniques willy-nilly. These techniques force drafters to spend more billable hours to ensure that they do not capture the prior art. When using these techniques, a drafter aims beyond a close trace around the embodiments specifically disclosed in the application. She aims


\textsuperscript{55} See Kevin Emerson Collins, The Reach of Literal Claim Scope into After-Arising Technology: On the Construction of Things and Meanings (manuscript at 15, on file with author), available at http://works.bepress.com/cgi/viewcontent.cgi?article=1003&context=kevin_collins (“The simplest way to illustrate that literal claim scope routinely reaches into AAT is to highlight the everyday occurrence of physical blocking patents (‘blocking patents’)—claims in earlier—and later-issued patents that both read on the same technology.”).

\textsuperscript{56} Id.


\textsuperscript{58} Applera Brief, supra note 57, at 21–22.
to gerrymander a fragile silhouette of breadth and precision. This ambition demands creativity, exercise in logic, consultation with the inventor, and sometimes even independent research on the part of the drafter.

Moreover, by convoluting literal claims, these techniques degrade the notice provided by literal claims. Which patent system would provide better notice: one in which literal claims are straightforward but enjoy a penumbra of equivalents, or one in which literal claims are convoluted and enjoy absolutely no penumbra of equivalents? I believe the former system can provide better notice, as long as the penumbra of equivalents hews close enough to the literal claims that DOE infringement remains very much the exception rather than the rule.

So far, we have ignored the threshold question of whether the DOE should cover AAT. If the DOE should not cover AAT, the claim that the alleged substitutes are good substitutes strengthens. Some commentators point out that exclusive rights to unforeseeable AAT provide little incentive to invent because inventors ex ante are little motivated by what they cannot foresee. 59 Meanwhile, patent rights to AAT generate monopoly loss and ex post rent dissipation on par with that generated by patent rights to technology that does not qualify as after-arising. 60 Accordingly, patent rights to unforeseeable AAT provide little bang for the buck. 61

However, foreseeability is a matter of degree. When characterized at a high level of generality, almost all events seem foreseeable. For example, you can readily foresee the general prospect that you might be in a car accident one day. It is the details of that accident that are unforeseeable. You cannot readily foresee precisely when, where, and how that accident would occur. Though, if you tend to engage in certain patterns of driving, you might have some idea about when, where, or how such an accident would most likely occur.

59 See Meurer & Nard, supra note 57, at 1992-93 (proposing that “the DOE should not apply to unforeseeable later-developed technology because . . . the inventor cannot coordinate development along a pathway that depends upon unforeseen technology”); Tun-Jen Chiang, Ex Post Claiming 36 (July 14, 2008) (unpublished working paper, http://ssrn.com/abstract=1023829) (arguing that vague expectations of future benefits confer some incentive, but it is very small); see also Shyamkrishna Balganesh, Foreseeability and Copyright Incentives, 122 HARV. L. REV. (forthcoming 2009) (manuscript at 32, on file with author) (referencing Michael Meurer and Craig Nard’s argument that “limiting patent law’s doctrine of equivalents—which allows a patentee to control uses of the invention that weren’t foreseeable and therefore not literally covered by the patent’s claims—is likely to have little to no impact on the original incentive”); Gideon Parchomovsky, Peter Siegelman & Steve Thel, Of Equal Wrongs and Half Rights, 82 N.Y.U. L. REV. 738, 756–57 (2007) (defining windfalls in terms of unforeseeable and thus un-incentivized gains).

60 Chiang, supra note 59, at 36 (“The incentives conferred by vague expectations of future benefits is disproportionately smaller than the monopoly costs.”).

61 Id. at 36.
Likewise, inventors ex ante cannot readily foresee the details of AAT, but they can readily foresee the general possibility of AAT, and they may foresee the rough outlines of AAT. DOE coverage of AAT can incentivize inventions and save on claim drafting costs when inventors ex ante foresee the general risk of AAT or its broad contours, but cannot foresee the precise way in which the AAT will materialize and cannot otherwise draft claims at low cost to literally encompass the AAT. In other words, the DOE incentivizes invention and saves on claim drafting to the extent the inventor foresees a general risk that a valuable product could slip through his literal claims but cannot foresee, and thus cannot readily foreclose, the particular path by which the valuable product would slip through his literal claims.

III. STAY INJUNCTIONS AGAINST DOE INFRINGEMENT

The Patent Act states that courts “may grant injunctions in accordance with the principles of equity.” 62 However, when courts find a claim infringed, either literally or under the DOE, they usually issue a permanent injunction against the infringer, 63 even after the Supreme Court’s decision in eBay, Inc. v. MercExchange, L.L.C. 64 Moreover, courts’ decisions about injunction do not turn on whether the infringer infringed the claim’s literal scope as opposed to the claim’s DOE scope. 65 The law governing injunction against infringement thus ignores the fact that DOE scope is blurrier than literal scope. As a result, potential infringers of DOE scope face a daunting combination of blurry scope and a harsh remedy for trespassing onto it. They face the harsh remedy of traditional property without the clear boundaries of traditional property.

Softening the remedy for DOE infringement would mitigate this asymmetry. Of course, softening the remedy will soften inventors’ faith in the DOE, which will result in less of the benefits that faith in the DOE provides. The larger question is whether softening the remedy will improve the DOE’s ratio of social costs to social benefits. The answer depends on how we soften the remedy.

I propose that we reserve instant injunctions for literal infringers. DOE infringers should always enjoy a modest stay (e.g., one year from final judgment) in which to come into compliance with the permanent injunction. This proposal reflects the middle position of DOE infringement on the continuum between

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63 See Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1246–47 (Fed. Cir. 1989) (“It is the general rule that an injunction will issue when infringement has been adjudged . . . .”).
64 PatStats Database, supra note 9 (showing fifty-seven permanent injunctions granted and seventeen denied since eBay, Inc. v. MercExchange, L.L.C.).
liability rules and property rules. Property rules provide harsh remedies that strongly encourage would-be takers to obtain owners’ consent in advance. Property rules tend to reign where the parties can easily bargain over the property in advance. Liability rules usually aim to award mere actual damages to entitlement holders, which does not much encourage takers to obtain consent in advance. Liability rules tend to reign where the parties cannot easily bargain over the entitlements in advance.

In substance, DOE scope lies intermediate the archetypical domains of property rules and liability rules. Compared to real property, identifying the periphery of DOE scope and bargaining in advance for the right to traverse it is a nightmare. On the other hand, DOE scope is far more identifiable and amenable to bargaining than, say, the levels of precaution adopted by oncoming drivers.

Today the law treats DOE scope as if it resides deep in the property end zone, even though the mixed features of DOE scope suggest that it really resides closer to the fifty-yard line between the property end zone and the liability end zone. In other words, the law currently denies DOE scope the “third way” treatment it seems to merit. That would change a bit if we guaranteed DOE infringers a modest stay, or grace period, to comply with an injunction. A modest stay would seldom rob the patentee of his ultimate right of exclusion. Nor would a modest stay increase the burden on courts of valuing inventions. In most cases, the court will have already assessed infringement damages for the year preceding the date of the court’s judgment.

What is the social harm of, in effect, granting the DOE infringer a compulsory license that lasts one year from the date of judgment, combined with an order that the infringer not increase the level of infringement during that year? Of course,

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68 See Friedman, supra note 67, at 57–59 (explaining that property rules are attractive when the cost of transferring rights through the market is low).
69 Id.
70 Id.
the stay will weaken the patentee’s bargaining power, but it will do so more when
the patentee’s bargaining power is a function, not of the technological merit of his
invention, but of the DOE infringer’s sunk costs and of flaws in the patent
system such as poor notice and porous gates against obvious patents. Compared
to a patentee whose invention is technologically significant, a patentee whose
invention is technologically trivial derives a greater proportion of his bargaining
leverage from the ability to enjoin the infringer’s operation. If the invention is
trivial—in the sense of being easy to design around or not being better than the
alternatives—the infringer will pay only a low royalty to continue using the
invention after the stay expires. If the patented invention is significant—in the
sense of being hard to design around or being better than its alternatives—the
infringer will pay a high royalty to continue using the invention after the stay
expires.

The threat of being enjoined from using something trivial would not be so
problematic if infringers could reliably identify and interpret the relevant patents
in advance. But infringers often cannot. Indeed, the more trivial the innovation
in question, the less likely a reasonable infringer would regard that innovation as
a potentially patentable invention that merits a patent search in advance of
commercialization. In other words, the closer an invention is to being obvious,
the higher are the odds that someone will not only infringe a patent on that
invention but do so inadvertently. Not only is a reasonable infringer less likely to
search for a patent on some invention that is borderline obvious, the infringer is
also more likely to independently invent that invention.

IV. USE THE SAME STANDARDS FOR 112(6) EQUIVALENTS

Under 35 U.S.C. § 112(6), a claim that expresses a limitation as “a means or
step for performing a specified function . . . shall be construed to cover the
corresponding structure, material, or acts described in the specification and
equivalents thereof.” The Federal Circuit has said that these statutory equivalents
are subject to the same “insubstantial change” test as the equitable equivalents
available under the DOE. Yet, the Federal Circuit distinguishes § 112(6)
equivalents from DOE equivalents. The Federal Circuit says that § 112(6)
equivalents define the literal scope of the claim’s functional language.

Can DOE equivalents be applied on top of § 112(6) equivalents? Can there
be “equivalents of equivalents”? No court decision suggests that there can be
such double expansion of a functional limitation. But why not? If § 112(6)
equivalents really define literal scope, why isn’t that literal scope entitled to the

DOE equivalents to which literal scope is normally entitled? If § 112(6) equivalents really define literal scope, then "equivalents of equivalents" are really DOE equivalents of literal scope.

Can DOE equivalents be applied instead of § 112(6) equivalents? Maybe. A few opinions suggest that DOE equivalents are available to expand a functional limitation in a direction that § 112(6) equivalents cannot expand, namely, forward to cover after-arising technology (AAT). In *Al-Site Corp. v. VSI Int'l, Inc.*, the Federal Circuit said that literal scope is keyed to the issue date and, because § 112(6) equivalents define literal scope, they cannot embrace AAT. Section 112(6) equivalents can only embrace things available when the patent issued. In contrast, DOE equivalents are keyed to the date that infringement began and can encompass AAT. Thus, AAT could infringe under the DOE without infringing under § 112(6). In sum, *Al-Site* suggests that for functional limitations, § 112(6) equivalents should be applied to things available when the patent issued and that the DOE should be applied to things that arose later.

The jurisprudence of § 112(6) equivalents is a mess that gets messier the more one looks at it. Furthermore, claims with functional limitations often also

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73 *See Al-Site Corp. v. VSI Int'l, Inc.*, 174 F.3d 1308, 1320–21 (Fed. Cir. 1999) (comparing § 112(6) equivalents to DOE equivalents); NOMOS Corp. v. BrainLab U.S.A., Inc., 357 F.3d 1364, 1369 (Fed. Cir. 2004) (holding that DOE may apply to means plus function limitation, if necessary, to cover AAT).

74 An equivalent structure or act under § 112 cannot embrace technology developed after the issuance of the patent because the literal meaning of a claim is fixed upon its issuance. An "after arising equivalent" infringes, if at all, under the doctrine of equivalents. Thus, the temporal difference between patent issuance and infringement distinguish an equivalent under § 112 from an equivalent under the doctrine of equivalents. In other words, an equivalent structure or act under § 112 for literal infringement must have been available at the time of patent issuance while an equivalent under the doctrine of equivalents may arise after patent issuance and before the time of infringement. An "after-arising" technology could thus infringe under the doctrine of equivalents without infringing literally as a § 112, ¶ 6 equivalent.

75 *Id.*

76 *Id.*

include non-functional limitations. In such cases, the court may have to apply the law of § 112(6) equivalents to some limitations, the law of DOE equivalents to other limitations, and sometimes the law of both types of equivalents to the same limitations. Realistically speaking, however, the probability that an accused product infringes does not detectably depend on whether a court purports to apply the law of § 112(6) equivalents or the law of the DOE.

The upshot is that the distinctions between § 112(6) equivalents and DOE equivalents are not worth their weight. The distinctions complicate doctrine without fine-tuning patent scope in a meaningful, much less a salutary, way. The initial rationale for labeling § 112(6) equivalents as statutory, and thus distinct from DOE equivalents, was simply that the patent statute refers to “equivalents” in § 112(6). This rationale puts too fine a point on the matter. Anyway, there is no evidence that Congress or the drafters of the Patent Act intended that § 112(6) equivalents be treated differently.

We should simply treat § 112(6) equivalents the same as DOE equivalents, with one exception. The exception is that for functional limitations, we should apply the DOE not to the functional claim language per se, but to the structure disclosed in the specification that corresponds to that claim language. In other words, if we want to retain some distinction between § 112(6) equivalents and DOE equivalents, the distinction should reside solely in what gets compared to what. For the DOE, we compare the accused element to the claimed limitation and ask whether the accused element is equivalent to that claimed limitation. For § 112(6), we should compare the accused element to the disclosed structure that corresponds to the claimed limitation and ask whether the accused element is equivalent to that disclosed structure.

V. REEVALUATE PROSECUTION HISTORY ESTOPPEL

Under the doctrine of prosecution history estoppel (PHE), the DOE cannot cover what a patentee surrendered to obtain the claim. PHE comes into play if, during prosecution, the applicant amends a claim for a reason related to patentability and in so doing narrows the claim in some respect, or if, during prosecution, the applicant argues for a claim interpretation that is narrower in some respect than the claim’s broadest reasonable interpretation.


80 Rigamonti, supra note 79, at 166 (statutory basis for “equivalents clause”).
81 Id. at 165 (discussing the absence of legislative history regarding 112(6)).
82 See JANICE M. MUELLER, AN INTRODUCTION TO PATENT LAW 298–99 (2d ed. 1987).
In *Festo II*, the Court held that any narrowing amendment is: (1) presumed to be for a reason related to patentability; and (2) presumed to bar all equivalents for the amended limitation.\(^{84}\) If the patentee rebuts (1), the amendment does not bar equivalents.\(^{85}\) If the patentee cannot rebut (1), he may still capture equivalents ranging as far as the extent to which he rebuts (2).\(^{86}\) He can rebut (2) in three ways, by showing: that the equivalent was unforeseeable, that the reason for the amendment was unrelated to the purported equivalent, or some other reason that he could not reasonably be expected to literally claim the equivalent.\(^{87}\)

Jay Thomas argues that PHE is not worth the candle and that we should ignore the prosecution history.\(^{88}\) First, he argues, in most areas of the law estoppel requires detrimental reliance.\(^{89}\) Generally, someone has to rely on the act or statement to their detriment. Yet, in patent cases courts do not ask whether the accused infringer actually relied on the prosecution history. Second, accused infringers do not usually examine the prosecution history until after they have been accused of infringement.\(^{90}\) Third, to the extent that accused infringers do rely in advance on the prosecution history, they do so largely because the doctrine of PHE exists.\(^{91}\) If it did not exist, accused infringers would seldom rely on the prosecution history.

These arguments are compelling, but they sidestep the main rationale for PHE. Its main rationale is to deter applicants from overreaching during ex parte prosecution. When the applicant's words and representations can be used against him, and when he is unsure which claim interpretation will serve his interests in the future, he chooses his words and representations more carefully and with more fealty to the truth.

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\(^{84}\) *Id.* at 733–34, 737.

\(^{85}\) *Id.* at 735–40.

\(^{86}\) *Id.*

\(^{87}\) *Id.* at 740–41.


\(^{90}\) See *id.* at 203 ("[T]he number of technologists who sift through Patent Office files in order to be misled by statements of their competitors, while not zero, seems small indeed.").

\(^{91}\) See *id.* at 200 (patent bar response to emphasis on prosecution histories in claim interpretation).
This rationale can be framed in terms of general reliance. In general, the threat posed by PHE allows examiners to rely more on applicant arguments and claims. If applicants could argue and claim whatever they wanted to, with no expected punishment for overreaching, patent examinations would become more difficult and patents would become less reliable records for the public at large.

Thomas also argues that PHE is superfluous over the prior art limit on DOE scope. That is, PHE is an inferior proxy for the question of whether the purported equivalent falls into the prior art. This argument is compelling, but likewise falls short. PHE is not superfluous over the prior art limit on DOE scope. As Thomas acknowledges, PHE applies not only to amendments and arguments that avoid prior art, but also to amendments and arguments that head off other problems with patentability such as lack of written support. Further, PHE constrains DOE scope more than the prior art does. The prior art merely prevents the scope of equivalents from extending beyond the forward edge of the prior art. Under the absolute bar of Festo I, PHE reduces DOE scope to zero. Under the flexible bar of Festo II, PHE need not reduce DOE scope to zero but, if there is any unrebutted PHE, DOE scope will not extend all the way to the forward edge of the prior art. Finally, as discussed above, what applicants say matters because what applicants say affects the chances that the claims they want will issue. That is, courts should monitor what applicants say because what they say affects what examiners do.

Of course, PHE has its costs. It complicates infringement analysis, which directly increases the costs of patent clearance, licensing, and litigation. Further, some examiners may rely on PHE itself. Examiners who are aware of PHE may think they have done enough when they record a narrowing amendment or argument somewhere in the prosecution history, rather than requiring that
everything necessary to interpret a claim appear explicitly in the claim or the specification. This habit of examiners increases the burden on potential infringers and others who must analyze claims because these amendments and arguments tend to be buried in long prosecution histories. PHE also increases the costs of claim drafting and prosecution because applicants strive to master the doctrine's fine points and to strategize at length to avoid an estoppel.

Do the benefits of the doctrine of PHE outweigh its costs? I want to conclude that the threat of penalty for overreaching promotes overall efficiency much the same way that the threat of criminal punishment promotes efficiency despite the costs of apprehending and incarcerating criminals.

It is harder to conclude, however, that the doctrine will remain beneficial in the future. The process of obtaining a patent grant from the government may become more adversarial. Inter partes reexamination is now available, and the United States may soon adopt more liberal means of post-grant review. By deterring applicants from overreaching, these adversarial processes serve as at least partial substitutes that can take over some of the police work that PHE performs today.

On the other hand, reformers have proposed reforms to the doctrine of inequitable conduct that would decrease the frequency of, or the consequences of, findings of inequitable conduct. Both PHE and the doctrine of inequitable conduct discourage applicants from overreaching during ex parte prosecution. If reform of the doctrine of inequitable conduct renders it less threatening to applicants, PHE may become more socially valuable because PHE can take over some of the police work that the doctrine of inequitable conduct performs today.

More useful is to ask whether reform can improve PHE's ratio of costs to benefits. Patent Failure shows that, in general, we need more bright lines, especially bright lines that facilitate bargaining in advance of R&D or commercialization. Unfortunately, having bright lines is always in tension with having the flexibility later to reach the right result on the substantive merits in the case at hand. Bright lines are always in tension with substantive accuracy or justice in hard cases. Good law makes hard cases. To make the law better, we must be more willing to take hard stands and reach results that seem wrong under the oddball facts of exceptional cases.

99 S. 1145 §§ 11-12; H.R. 1908 § 11.
100 See BESEN & MEURER, supra note 1, at 7-10, 21-27, 46-54 (explaining that when investors cannot identify who owns what technology in advance—because patent boundaries are unclear and unpredictable—investors' litigation risks will tend to exceed their expected revenue from investment in innovative products).
In deference to the notice function of claims, the Federal Circuit set forth a bright line in *Festo I*. Under the absolute bar of *Festo I*, any narrowing amendment related to patentability irrebuttably bars all equivalents for the amended limitation. In *Festo II*, the Supreme Court re-blurred the line by holding that a patentee may rebut the bar and capture equivalents ranging as far as the extent to which the patentee can show that the equivalent was unforeseeable, the amendment was unrelated to the purported equivalent, or some other reason that he could not have been expected to claim the purported equivalent.

On first pass, and with *Patent Failure* in mind, the absolute bar of *Festo I* seems more attractive than the flexible bar of *Festo II*. Under *Festo I*, the effects of PHE on DOE scope are easier to estimate in advance. Under *Festo I*, any narrowing amendment simply erases all DOE scope for the amended limitation.

*Festo I* also seems to go hand in hand with reform of the DOE. If DOE scope, or the penalty for violating it, is cut back, there will be less equivalency for PHE to take away in the first place. The absolute bar of *Festo I* would increase the average relative size of the chunk of equivalency that PHE takes away, which could offset what would otherwise be a drop in the applicant’s expected downside from overreaching during prosecution. In other words, if we curtail the DOE through reform, the DOE pie will be smaller; but if we also adopt the absolute bar of *Festo I*, PHE will take away a proportionately larger slice of that smaller pie.

There is a problem, however, with the absolute bar of *Festo I*. It punishes minor overreaching just as harshly as it punishes egregious overreaching. Under *Festo I*, a small narrowing amendment and a big narrowing amendment bar the same amount of DOE scope for the amended limitation—all of it. The Supreme Court characterized this mismatch between the crime and the punishment as foreign to equity.

The mismatch may also be inefficient. If a narrowing amendment of any magnitude kills all DOE scope, applicants could respond in various ways. Some applicants could go to great lengths to avoid amending claims after filing. These applicants would search the prior art before filing, draft the original claims very carefully, and look for alternative ways to influence examiners, thereby driving up the costs of claim drafting and prosecution. Other applicants could deliberately claim less than they have invented, in the belief that overly narrow literal scope plus DOE scope is broader than accurate literal scope plus zero DOE scope.

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102 Id. at 1372.
104 See *Festo II*, 535 U.S. at 738.
Still, other applicants could overreach more egregiously, reasoning that if the punishment for grand larceny is the same as the punishment for petty theft, they might as well commit grand larceny.

More thought, and perhaps data, are necessary before we can conclude that the absolute bar's benefits (from clarifying DOE scope and increasing the fraction of DOE scope that PHE withholds) outweigh the absolute bar's costs (from distorting claim drafting and failing to promote marginal deterrence). Accordingly, here I can offer no specific reform of the doctrine of PHE.

VI. CONCLUSION

Under current law, most patent suits are suits against inadvertent infringers as opposed to suits against pirates. Rarely does a court find that an infringer actually copied the patented invention. Indeed, rarely does a patentee even allege that the infringer copied. Furthermore, according to Bessen and Meurer, accused infringers tend to spend more on R&D than do the patentees who sue them. This implies that the more a firm invests in new technology, the more that firm risks inadvertently infringing someone else's patent. The consequence, according to Bessen and Meurer, is that patents outside chemistry and pharmaceuticals actually discourage innovation and that most innovators would be better off with no patent system than with the one we have.

If the authors' data holds up under scrutiny, dramatic reform should follow. Even if the revised figures are less damning of the status quo than the authors', it is difficult to believe that the revised figures would be so improved as to belie the take-home message of Patent Failure, which is that, in terms of magnitude and importance, the costs of poor notice swamp the issues that most patent commentators spend most of their time worrying about.

We should worry about the DOE. It generates a big chunk of patent notice costs while providing only a modest chunk of patent incentives. At first glance, outright abolition of the DOE is tempting. A tamer version of the DOE, however, is likely better than no DOE at all. The competing effects of the DOE point to the need for a balance, not for abolition, at least not without first trying serious reform.

DOE scope is double-edged. To its owner, a patch of DOE scope is like an umbrella insurance policy. Inventor Jones’s DOE scope increases his incentive to engage in risky activity (inventing) and decreases Jones’s incentive to adopt costly precautions (like painstaking claim drafting), when he knows that he is

105 See supra note 3 and accompanying text.
106 See supra note 3 and accompanying text.
107 BESSON & MEURER, supra note 1, at 95–146.
exposed to a class of risk (failure of literal scope to recoup his cost of the invention) but can neither predict, nor otherwise adopt cheap precautions to obviate, the chain of events through which specific risks in the class could materialize. To Smith, a potential infringer, Jones’s patch of DOE scope is like a minefield. Jones’s DOE scope increases Smith’s risk. Of course, Smith enjoys the security afforded by her own patch of DOE scope, and other parties fear her DOE scope. Again, this tension—between the tendency of a patch of DOE scope to decrease the risk of inventing for its owner and to increase the risk of inventing and commercializing for others—calls for a balance in the DOE, a balance that ensures that the DOE lowers risk for inventors more than it increases it.

I have proposed that we soften the remedy for DOE infringement and collapse § 112(6) equivalents into the DOE. These reforms are not enough by themselves to tame the DOE. Nor is PHE the only legal limit on DOE scope that needs to be reassessed. Some of the legal limits seem inconsistent with each other, some seem redundant, and some seem to create perverse incentives. Unsurprisingly, the courts apply them ad hoc.

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109 With respect to perverse incentives, for example, consider the public dedication rule. Under this rule, the DOE cannot cover subject matter that the patentee disclosed but failed to claim. Johnson & Johnston Assoc., Inc. v. R.E. Serv. Co., 285 F.3d 1046, 1054 (Fed. Cir. 2002). This rule increases the costs of drafting applications, because it encourages drafters both to think more deeply about the shape that the claims will eventually assume and to comb through draft applications to remove anything unnecessary to support that shape. Concomitantly, this rule also penalizes patentees who disclose more information than they need to support the claims, which seems perverse insofar as the information disclosure rationale for the patent system holds water.

The tests for technological equivalence\textsuperscript{111} are also vexing. The overarching test—are the differences between the claimed invention and the accused device "insubstantial"?—merely rephrases the question.\textsuperscript{112} The function-way-result subtest\textsuperscript{113} seems a bit more useful but it would be nice to know how its function prong differs from its result prong. If an accused device has substantially the same function as the claimed device, when would the accused device not achieve substantially the same result as the claimed device? A dictionary definition of the word "function" is "the action for which a person or thing is specially fitted or used."\textsuperscript{114} This definition seems to imply that referring to a thing's function is merely a way of referring to the result achieved by the thing. Is this three-prong subtest really a two-prong subtest?

The DOE needs a lot of work.\textsuperscript{115}

\textsuperscript{111} The judge determines legal equivalence. The jury, or the judge in a bench trial, determines technological (or factual) equivalence. \textit{See} \textit{Graver Tank}, 339 U.S. at 609–10.

\textsuperscript{112} Durham, \textit{supra} note 48, at 971, 992–93. Durham proposes that we partially merge the test for equivalents and the test for obviousness.

The test I will propose is this: the accused combination is equivalent to the claimed combination if, at the time the patent application was filed, a person of ordinary skill in the art, aware of both the claimed combination and the substituted element, would have found it obvious to make the substitution. \textit{Id.} at 973–74 (emphasis added). His proposal merits serious consideration.

\textsuperscript{113} Under the function-way-result subtest, an accused element is technologically equivalent to the claimed element if the accused element performs substantially the same function in substantially the same way to achieve substantially the same result. \textit{See} \textit{Graver Tank}, 339 U.S. at 608.

\textsuperscript{114} \textit{Merriam-Webster's Collegiate Dictionary} 507 (Frederick C. Mish ed., 11th ed. 2003).

\textsuperscript{115} \textit{See} Michel, \textit{supra} note 108 (stating that the DOE "has proven to be the most difficult and least predictable of all doctrines in patent law to apply"); Sarnoff, \textit{supra} note 39.