

TAMING THE DOCTRINE OF EQUIVALENTS IN LIGHT OF *PATENT FAILURE*

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ABSTRACT

In their book *Patent Failure*, Jim Bessen and Michael Meurer show that patents outside the fields of chemistry and pharmaceuticals *discourage* innovation. One reason is that, outside these two fields, patents provide poor notice of what technology is owned and who owns it. Poor notice is due in part to the doctrine of equivalents (DOE). This essay argues against abolishing the DOE, and instead proposes reforms to mitigate the DOE's interference with notice. Specifically,

- DOE protection should expire before a patent's 20-year term expires, *e.g.*, the DOE should apply only to activity that the infringer first began within 10 years of the patent's filing date;
- courts should always stay permanent injunctions against DOE infringement for a modest period of time, *e.g.*, for one year from the date of final judgment; and
- courts should treat equivalents under 35 USC 112(6) the same as DOE equivalents.

This essay also briefly reevaluates the doctrine of prosecution history estoppel in light of *Patent Failure*.

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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*,¹ 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 today patents in fields outside chemistry and pharmaceuticals *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,² that the patent system actually taxes innovation outside chem-pharma.³ Outside

* Assistant Professor, George Mason University School of Law. For helpful comments, the author thanks Lloyd Cohen, TJ Chiang, Adam Mossoff, and [list to be expanded].

¹ See James Bessen & Michael J. Meurer, *Patent Failure: How Judges, Bureaucrats, and Lawyers Put Innovators at Risk* (Princeton Press 2008) (as of July 1, 2008, chapters 1, 3 and 9 available for free at <http://www.researchoninnovation.org/dopatentswork/>). Cf. Michael Risch, The Failure of Public Notice in Patent Prosecution, 21 Harv. J. L. & Tech. 179 (2007).

² Accused infringers tend to spend *more* on R&D than do the patentees who sue them. In other words, the more a firm spends on R&D, the more likely that firm is to be sued for infringement. See Bessen & Meurer, *Patent Failure*, at 123-26; James Bessen & Michael J. Meurer, *Patent Litigation with Endogenous Disputes*, 96 Amer. Econ. Rev. 77 (2006); James Bessen & Michael J. Meurer, *The Patent Litigation Explosion* (Boston Univ. Sch. of Law Working Paper No. 05-18, 2005), available at ssrn.com. 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, Working Paper, pp.24, 32-33 (July 2008). See also Bessen & Meurer, *Patent Failure*, *supra* at 126, 277. Indeed, in only about five 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, at 20, 24.

³ See also Michael A. Heller and Rebecca A. Eisenberg, Can Patents Deter Innovation? The Anticommons in Biomedical Research, 280 Science 698 (May 1, 1998); Francesco Parisi, Ben Depoorter and Norbert Schulz, Duality in Property: Commons and

chem-pharma, 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. For similar reasons, profits per patent tend to be low outside chem-pharma, where patent profits must be divvyed up among the patchwork.

Patent Failure is a clarion call for myriad reforms. This essay focuses on the doctrine of equivalents (DOE). When courts find a patent infringed, they usually find it literally infringed. In only about one of every five cases in which a patentee wins a judgment of infringement is that judgment a judgment of infringement under the DOE.⁴ This statistic implies that four-fifths of patent incentives are provided by the literal scope of patent claims.

Yet, DOE infringement is litigated frequently. One of every two (as opposed to one of every five) decisions on infringement is a decision on DOE infringement.⁵ 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 get-go.

Given that literal scope provides most of the incentives that patents provide, given that DOE infringement is litigated disproportionately often, given the relevance of DOE scope in most cases, and given the inevitable uncertainty created by the DOE, the DOE generates high notice costs for every incremental incentive that it provides. The DOE provides perhaps one-fifth of patent incentives but generates well more than one-fifth of the notice costs, perhaps more than one-half.

Anticommons, 25 Int'l Rev. Law & Econ. (2005); Robert P. Merges & John F. Duffy, Patent Law and Policy: Cases and Materials, 4th ed., 198-200 (LexisNexis 2007) (discussing prisoner's dilemma logic of patents). *But see* Ted Buckley, The Myth of the Anticommons, Biotechnology Industry Organization (May 31, 2007).

⁴ This statistic is based on the numbers reported in the PatStats database, *available at* www.patstats.org/Patstats2.html (last visited June 13, 2008).

⁵ From 2000 to 2006, US courts issued 1283 decisions on literal infringement and 687 decisions on DOE infringement. *See Id.* Of the 1283 decisions on literal infringement, 29 percent were in favor of the patentee; 71 percent were in favor of the accused infringer. Of the 687 decisions on DOE infringement, 15 percent were in favor of the patentee; 85 percent were in favor of the accused infringer. *Id.*

Accordingly, worthwhile reform of the DOE is likely to entail a cut in the DOE's breadth or duration. The notice costs generated by a zone of exclusivity rise with the zone's breadth and duration. Other things equal, a potential trespasser is more likely to trespass onto a large parcel that long remains in private hands than to trespass onto a small parcel that soon enters the public domain. This is not to say that notice costs rise faster with a parcel's sheer breadth and duration than with uncertainty about the location and dimensions of the parcel's boundaries. We cannot, however, neatly exploit the distinction between uncertainty about the boundaries of DOE scope and the sheer breadth and duration of DOE scope. Compared to the boundaries of, say, real property, the boundaries of DOE scope are inherently blurry. So it is hard if not impossible to substantially reduce the DOE's interference with notice without cutting the sheer breadth or duration of DOE scope.

Part II explains why we should not cut the breadth and duration of DOE scope all the way to zero. The DOE provides social benefits in a variety of ways. Indeed, within a narrow range, the DOE even has a tendency to improve patent notice. And there is no good substitute for the DOE.

Part III tentatively proposes that we limit the DOE to activity that the infringer first began within 10 years of the earliest effective filing date of the patent in question. To accept this cut in the duration of DOE scope, we can take comfort in knowing that, as mentioned above, only a fraction of patent incentives are attributable to the DOE. Further, as discussed in Part III, the brunt of the patent incentives that are attributable to the DOE are attributable to DOE coverage in the first half of the patent term.

Part IV proposes a second way to reduce the DOE's notice costs — stay 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 will rest largely on the technological merit of his invention rather than on an ability to shut down the DOE infringer's product line overnight.

Part V proposes that we treat equivalents under 35 USC 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 doctrine without fine-tuning patent scope in a meaningful or salutary way.

Part VI reassesses the rationales for the doctrine of prosecution history estoppel. Part VI also explores the issue of whether, in light of *Patent Failure*, the absolute bar of *Festo I* beats the flexible bar of *Festo II*.

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. The DOE converts the question of infringement from a more binary question of identity to a more relative question of similarity. Let's briefly consider some famous cases.

In *Winans v. Denmead* (Sup. Ct. 1853), the patentee claimed a coal car with a downward tapering body shaped like a “frustum of a cone.”⁶ The accused infringer made a coal car with a downward tapering body shaped like an upside-down octagonal pyramid, which is 8-sided rather than round in the horizontal plane. The accused car did not literally infringe. Is it equivalent? Is an 8-sided car equivalent to a cone-shaped car for purposes of patent infringement?⁷ What if the accused car were 5-sided? What if it were 100-sided?

⁶ *Winans v. Denmead*, 56 US 330 (1853). Winans' claim read: “What I claim as my invention, and desire to secure by letters-patent is, making the body of a car for the transportation of coal, &c., in the form of a frustum of a cone, substantially as herein described, whereby the force exerted by the weight of the load presses equally in all directions, and does not tend to change the form thereof, so that every part resists its equal proportion, and by which also the lower part is so reduced as to pass down within the truck frame, and between the axles, to lower the centre of gravity of the load, without diminishing the capacity of the car as described.” US Patent No. 5175 to Winans.

⁷ The Court thought so. It held that the accused car was equivalent to the claimed car. The prior art coal cars were shaped like cubes, having four sides in the horizontal plane. The patentee disclosed no specific shapes other than the frustum of a cone but it was clear from the specification that the principle of the invention lay in the equal distribution of weight throughout the car. This principle found its purest expression in the round frustum of a cone but, from a practical standpoint, an eight-sided car performed

In *Graver Tank v. Linde* (Sup. Ct. 1950), the patentee claimed a welding composition “containing a major proportion of alkaline earth metal silicate.”⁸ The accused infringer used a silicate of manganese. Manganese is a transition metal, 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. Also, the specification referred to silicates of manganese in a way that made them seem equivalent to silicates of certain alkaline earth metals.⁹ Is the accused composition equivalent to the claimed composition?¹⁰

In *Corning Glass v. Sumitomo* (Fed. Cir. 1989), 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.¹¹ 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. Clearly the accused fiber did not literally infringe. Is it equivalent to the claimed fiber?¹²

substantially the same function in substantially the same way to achieve substantially the same result. *See Winans v. Denmead* (Sup. Ct. 1853).

⁸ *See Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605 (1950)

⁹ The patent’s specification stated: “we have used calcium silicate and silicates of sodium, barium, iron, manganese, cobalt, magnesium, nickel and aluminum... in various proportions.” [emphasis and brackets added] US Patent No. 2,043,960 to Jones. Calcium, barium and magnesium are alkaline earth metals. Sodium is an alkali metal. Iron, cobalt and nickel are, like manganese, transition metals.

¹⁰ The Court thought so. *See Graver Tank, supra*.

¹¹ *See Corning Glass Works v. Sumitomo Electric USA Inc.*, 868 F.2d 1251 (1989)

¹² The Federal Circuit thought so. Although Sumitomo’s core included no positive dopant, the court denied violating the all-limitations rule. The rule requires, wrote the court, that the claimed limitations (or their equivalents) appear in the accused device. 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. *See Corning Glass, supra*. 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.

In *Warner-Jenkinson v. Hilton Davis* (Sup. Ct. 1997), the patentee claimed a filtration process performed “at a pH from approximately 6.0 to 9.0.”¹³ The accused infringer’s filtration process performed at a pH of 5.0. The accused process did not literally infringe. Is it equivalent? Is a pH of 5.0 equivalent to a pH of “approximately 6.0” in the context of this technology?¹⁴

In *Festo Corp. v. Shoketsu* (Sup. Ct. 2002), the patentee claimed a device having two sealing rings each with one lip.¹⁵ The accused infringer’s device had one seal with a two-way lip. The accused device did not literally infringe. Is one seal with a two-way lip equivalent to two sealing rings each with one lip?¹⁶

In *Johnson & Johnston v. RES* (Fed Cir 2002), the patentee claimed a component, for use in printed circuit boards, comprising a “laminare constructed of a sheet of copper foil... and a sheet of aluminum...”¹⁷ The accused component employed a steel sheet rather than an aluminum sheet. Clearly the accused component did not literally infringe. However, the specification stated that “While aluminum is currently the preferred material for the substrate, other metals, such as stainless steel or nickel alloys, may be used.”¹⁸ Is the accused steel sheet equivalent to the claimed aluminum sheet?¹⁹

As these cases demonstrate, the DOE makes it hard to know what technology is owned and who owns it. This uncertainty generates direct and indirect notice costs. The

¹³ *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17 (1997)

¹⁴ The Court thought so. *Id.*

¹⁵ *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 172 F.3d 1361 (Fed. Cir. 1999)(*Festo I*); *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722 (2002) (*Festo II*).

¹⁶ The Court thought so, although it remanded the case for a determination of whether the doctrine of prosecution history estoppels barred recovery under the DOE. *See Festo II*.

¹⁷ *Johnson & Johnston Associates Inc. v. R.E. Service Co. Inc.*, 285 F.3d 1046 (2002)

¹⁸ US Patent No. 5,153,050 to Johnston [emphasis added]

¹⁹ 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. Thus steel was not legally equivalent to aluminum. 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. 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. *See Johnson & Johnston, supra*.

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. How can the DOE possibly *decrease* incentives to innovate? Because the DOE increases both the reward of patent protection and the risk of patent infringement. The DOE increases both the chance that the inventor’s patent will cover somebody else’s product and the chance that the inventor’s product will be covered by somebody else’s patent.

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 claims 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 patent. Why don’t the inventor’s expected downside and expected upside cancel each other out? Because inventors are risk-averse and weigh losses more heavily than gains of numerically equal magnitude, and because both patentees and infringers must incur transaction costs to transfer wealth between them.

B. The Benefits of the DOE

Should we abolish the DOE in its entirety and limit all patent infringement to literal infringement? Probably not.²⁰ 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. The DOE decreases the risk faced by inventor Jones that his patent rents will come in below the patent rents that he reasonably expected to make given the cost of creating the

²⁰ For an ostensibly opposing view, see Joshua D. Sarnoff, *Abolishing the Doctrine of Equivalents and Claiming the Future after Festo*, 19 Berkeley L. J. 1157 (2004); Chiang, *supra* at 54-57. Sarnoff’s view is only ostensibly opposing because he distinguishes between the current DOE and a milder doctrine of non-literal infringement, reserving the rubric “DOE” and his objection for the former. As I generally use the term, “DOE” refers to any form of non-literal infringement.

invention. The DOE thus resembles insurance: it increases Jones’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 to recoup the cost of invention) 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.

The rub is that, from the perspective of 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 Smith’s patent, and others fear the DOE scope afforded to Smith’s patent. This tension does not, however, preclude the possibility of the DOE improving incentives overall. Rather, as discussed in Part III, this tension speaks to the need for a balance in the law of the DOE, a balance that increases the overall ratio of the DOE’s risk-decreasing effects to the DOE’s risk-increasing effects.

Second, the DOE cuts the costs of drafting claims.²¹ 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.²² 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: (A) tortuous claims, worded like statutes, that aspire to literally encompass X and its equivalents; (B) functional language -- such as “means of fastening” rather than “shoelace” – that aspires to literally encompass X and its equivalents;(C) Markush-type language²³ that literally lists X and all of the individual equivalents of X that the drafter

²¹ Add cites. *See also* Joseph S. Cianfrani, *An Economic Analysis of the Doctrine of Equivalents*, 1 Va. J. L. & Tech. 1 (Spring 1997).

²² According to the cooperative principle of linguistics, efficient communication requires that speakers observe various cooperative maxims, and that listeners assume that the speakers are observing those maxims. *See* Paul Grice, “Logic and conversation,” in *Syntax and Semantics, 3: Speech Acts*, ed. P. Cole & J. Morgan. New York: Academic Press (1975), reprinted in *Studies in the Way of Words*, ed. H. P. Grice, pp. 22–40. Cambridge, MA: Harvard University Press (1989); http://en.wikipedia.org/wiki/Gricean_maxims (last visited July 18, 2008). *See generally* Kristen Jakobsen Osenga., *Linguistics and Claim Construction*, 38 Rutgers U. L. J. 61 (2006).

²³ Give example of Markush language.

can think up; or (D) 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, convoluted, wordy, tedious or numerous — in a word, “windy”. Windy claims, and specifications that support them, are harder to draft.²⁴

Try, for instance, to draft a claim for Winans using language that *literally* encompasses minor variants (like the accused 8-sided car) as well as the preferred cone-shaped car – without encompassing the prior art.²⁵ It is much easier to do what Winans apparently did -- 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 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 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 what appears to be its best incarnation, why should the patent recite a litany of minor variants?

Third, although a broad scope of equivalents degrades notice overall, a narrow scope of equivalents probably improves notice overall.²⁶ 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 hits 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 windy claims. Windy claims not only cost more to draft, they also cost more for potential infringers to identify and to interpret.

Furthermore, without the DOE, drafters have greater incentives to draft deliberately ambiguous claims. *Ambiguous literal scope is itself a substitute for DOE*

²⁴ Convoluting claims would also convolute the specification. Cf. Craig A. Nard, A Theory of Claim Interpretation, 14 Harvard J. Law & Tech. 1, 69 (2000-01) (“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.”)

²⁵ Winan’s actual claim is reproduced *infra*, note X.

²⁶ See also Samson Vermont, How Restricting Equivalents Conflicts – Yes, Conflicts – With the Notice Function of Claims, Law.com (May 31, 2001); Douglas Lichtman, Substitutes for the Doctrine of Equivalents, 93 Georgetown Law Journal 2013 (2005).

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.²⁷

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.²⁸ Under the doctrine of PHE, the DOE cannot cover what a patentee surrendered to obtain the claim. The doctrine of 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. The doctrine of 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.²⁹ Unfortunately, none is a good substitute. None reduces the costs of drafting claims, discourages the drafting of windy claims, or discourages overreaching during prosecution.

²⁷ See Risch, *supra* at 180-81, 188; William Landes and Richard Posner, *The Economic Structure of Intellectual Property Law* (2003).

²⁸ See *infra* Part VI.

²⁹ See Douglas Lichtman, *Substitutes for the Doctrine of Equivalent*, 93 *Geo. L. J.* 2013 (2005).

Amendments and reissues have short deadlines. Amendments must be made before the patent issues. Reissues that broaden claims must be filed within two years after the patent issues. We could extend or eliminate the deadline for broadening reissues, but it is far from evident that notice would improve if we allowed literal scope to be broadened throughout the patent term.³⁰ Eliminating the two-year deadline for broadening reissue would extend the period in which innovators face the risk of new boundaries popping up out of nowhere. Of course, the DOE extends this time period de facto. Which regime is best: de facto extension via the DOE, or explicit extension via broadening reissue available throughout the patent term? We do not know for sure. It is hard to know for sure whether what we have now (the DOE and a short deadline for broadening literal scope) provides better or worse notice than what we could have (no DOE and no deadline for broadening literal scope). Our experience with continuations, however, suggests that the latter (no DOE and no deadline for broadening literal scope) would provide worse notice. Although a continuation must be filed before the original application issues or is abandoned, filing a continuation is cheap and, once filed, the applicant can sit and wait to see what competitors do and then amend the pending claims accordingly. The costs generated by continuations appear to be so high that restricting if not eliminating them is one of the two or three reforms that can be fairly called a no-brainer in light of *Patent Failure*.³¹

The alleged substitutes are also inferior to the DOE at capturing after-arising technology (AAT), *i.e.*, technology that does not come into existence until after the patent is filed or issues.³² Some commentators argue that the substitutes cannot cover AAT

³⁰ Cf. Tun-Jen Chiang, Ex Post Claiming, George Mason U. School of Law (July 14, 2008).

³¹ Cf. Mark A. Lemley and Kimberly A. Moore, Ending Abuse of Patent Continuations, 84 B.U.L. Rev. 63 (2004); Harold C. Wegner, Abolishing Continuation: A Four Part Program to Improve the Patent Process, George Washington U. Law School (April 2, 2008). The clearest no-brainer is to change the judicial standard for indefiniteness from “insolubly ambiguous” to “not particular and distinct,” and to vigorously enforce the latter standard.

³² There appears to be disagreement about whether AAT is technology that arises after the filing date or after the issuance date. For example, compare *In re Hogan*, 559 F.2d 595, 605 (CCPA 1977) (after-arising technology is technology that comes “into existence after the filing date...”) to *Al-Site*, *infra* note X. On first pass, the inability of applicants

because the substitutes require that the revised literal claims be enabled and described by the application, but the application cannot enable and describe technology that did not exist when the application was filed.³³

These commentators put too little faith in literal claims. Literal claims routinely cover AAT.³⁴ Otherwise blocking patents would be impossible.³⁵ 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 they can use special claim drafting techniques to literally cover AAT.³⁶ 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.³⁷

These commentators put too much faith in literal claims. Applicants can sometimes use these techniques to literally cover AAT. These techniques do not always work 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. For the reasons just stated, drafters cannot employ these techniques willy-nilly. Drafters must take care to ensure that they do not capture the prior art. When using these techniques, a drafter

to add new matter to pending applications suggests that the filing date should start the clock for AAT.

³³ Cotropia, *supra*. Cf. Craig A. Nard, A Theory of Claim Interpretation, 14 Harvard J. Law & Tech. 1, 68-73 (2000-01).

³⁴ See Kevin Emerson Collins, The Reach of Literal Claim Scope into After-Arising Technology: On the Construction of Things and Meanings, forthcoming Connecticut L. Rev.

³⁵ *Id.*

³⁶ See Meurer & Nard; Amici Curiae Applera Corporation (Applied Biosystems and Celera Genomics), Applied Materials, Inc., Cisco Systems, Inc., Micron Technology, Inc. and Oracle Corporation in Support of Respondents, *Festo II* (No. 00-1543), at 2001 WL 1548692 [hereinafter Applera Brief].

³⁷ See Applera Brief, *supra* at 21-22; Meurer and Nard, *supra*.

aims beyond a close trace around the embodiments specifically disclosed in the application. She aims 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 windy 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 a bit. Michael Meurer and Craig Nard argue that exclusive rights to AAT provide little incentive to invent — because AAT is unforeseeable to inventors *ex ante* and because inventors are little motivated by what they cannot foresee.³⁸ 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*. Accordingly, patent rights to AAT, especially those supplied by the DOE, provide little bang for the buck.³⁹

I disagree to the degree that foreseeability is a matter of degree. Inventors *ex ante* cannot readily foresee the details of AAT, but they can readily foresee the general possibility of AAT and they sometimes can readily foresee the rough outlines of AAT. DOE coverage of AAT can incentivize inventions and save on claim drafting when inventors *ex ante* foresee the general risk of AAT or its broad contours, but cannot foresee the precise way in which AAT will materialize and cannot otherwise draft claims at low cost to literally encompass the AAT. In other words, the DOE incentivizes

³⁸ Michael J. Meurer & Craig A. Nard, *Invention, Refinement and Patent Claim Scope: A New Perspective on the Doctrine of Equivalents*, 93 *Geo. L. J.* 1947 (2005); Michael J. Meurer & Craig A. Nard, *Patent Policy Adrift in a Sea of Anecdote: A Reply to Lichtman*, 93 *GEO. L. J.* 2033 (2005). See Tun-Jen Chiang, *Ex Post Claiming*

³⁹ Chiang, *supra*.

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.⁴⁰

III. TIME LIMIT ON DOE COVERAGE

Again, DOE scope is double-edged. To its owner, a patch of DOE scope is like an umbrella insurance policy. Jones's DOE scope increases Jones's incentive to engage in risky activity (inventing) and decreases his incentive to adopt costly precautions (painstaking claim drafting techniques), when Jones knows that he is 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.⁴¹

⁴⁰ A possible second argument for DOE coverage of AAT is that patents depreciate rapidly in fields that change rapidly. By covering AAT, the DOE mitigates the depreciation of patents in these fields, which helps raise patent incentives in these fields closer to the patent incentives in fields that change more slowly. In short, so the argument goes, without the DOE, incentives to invent would be too weak in rapid fields. See Christopher A. Cotropia, *"After-Arising" Technologies and Tailoring Patent Scope*, 61 N.Y.U. Ann. Surv. Am. L. 151 (2005); Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 Col. L. Rev. 839 (1990); Ted O'Donoghue, Suzanne Scotchmer, and Jacques-Francois Thisse, *Patent Breadth, Patent Life, and the Pace of Technological Progress*, 7 J. Econ. & Mngmt. Strat. 1 (Spring 1998). The jury is still out, however, on whether this particular argument has legs. This argument seems backward at first glance. At first glance, rapid fields seem like the fields we can worry about least. The very fact that a field is rapid seems to imply that the incentives in that field cannot be very insufficient. If the incentives were very insufficient, the technology in the field would not change so rapidly. Also, in rapid fields (such as software and computer hardware) DOE scope seems to generate higher notice costs and to entangle relatively more improvement inventions. Perhaps the solution is to distinguish between AAT that derives most of its value from its technological merits and AAT that derives most of its commercial value from its ability to avoid the literal scope of the claims in question. Perhaps, in other words, we should focus not on the distinction between fields that change rapidly and fields that change slowly but on the distinction between literal claims that are evaded rapidly and literal claims that are evaded slowly.

⁴¹ 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

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 Smith’s DOE scope to his own patent, and other parties fear Smith’s DOE scope.

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 everyone else – calls for a balance in the law of the DOE, a balance that ensures that the ratio of the DOE’s risk-decreasing effects to its risk-increasing effects exceeds 1. I argue here that limiting DOE protection to the first half of the patent term may increase this ratio. More specifically, I tentatively propose that the DOE be limited to activity that the infringer first began within, say, 10 years of the earliest effective filing date of the patent in question.

[Note: this part of the paper, Part III, needs work. I’m not sure it holds up. I may have to abandon it.]

A. The Incentive Effects of Patent Scope Fall as the Patent Term Unfolds

Patent incentives hinge on the ability of inventors ex ante to foresee patent rents. The less foreseeable the rents, the less the rents increase incentives to invent. Generally, rents late in the patent term are less foreseeable than rents early in the patent term. Inventors ex ante can foresee rents from the first half of the term more clearly than they can foresee rents from the second half. Other things equal, an inventor at year 0 can foresee the rents that he could receive in years 1-10 more clearly than he can foresee the rents he could receive in years 11-20. The prospect of rents in years 1-10 thus affects the inventor’s behavior ex ante more than does the prospect of rents in years 11-20.

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* failing to look in your rear-view mirror may be a very expensive precaution. *See generally* Mark Grady, Tort Reform: An Economic Approach, 2 *Journal of Forensic Economics* 1, 5-7 (1988) (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); study cited by Grady (showing that most medical malpractice judgments were for obvious errors rather than for debatable exercises in judgment).

Relatedly, in discounting to present value inventors discount the rents expected from the second half of the term more heavily than they discount the rents expected from the first half. Inventors discount for risk including the high risk of obsolescence. Some inventions are obsolete within a few years; more than half are obsolete within 10 years; the vast majority are obsolete before the end of the 20-year patent term.⁴² The rate of obsolescence – the depreciation rate -- is the rate at which inventions fall in value over time. The depreciation rate may increase as the patent term unfolds. Landes and Posner find that, on average, patents depreciate at a rate of 4.8 percent per year for the first four years after issue, 6.9 percent per year for the next four years, and 8.3 percent per year

⁴² See O'Donoghue et al, *supra*; Jean Olson Lanjouw, Patent Protection: Of What Value and for How Long? NBER Working Paper No. 4475 (Sept. 1993); Ariel Pakes and Mark Schankerman, 'The Rate of Obsolescence of Patents, Research Gestation Lags, and the Private Rate of Return to Research Resources,' in Zvi Griliches, ed., *R&D, Patents, and Productivity*, Chicago: University of Chicago Press, 73–88 (1984); Pakes, A., 1986, "Patents as Options: Some Estimates of the Value of Holding European Patent Stocks," *Econometrica*, 54, 755–785; E. Mansfield, 'R&D and Innovation: Some Empirical Findings, in Zvi Griliches, ed., *R&D, Patents and Productivity*, (U. Chicago Press 1984); Levin, R.C., A.K. Klevorick, R.R. Nelson, and S.G. Winter, 1987, "Appropriating the Returns from Industrial Research and Development," *Brookings Papers on Economic Activity*, 3 (Special Issue), 783–831. Patentees allow the majority of their US patents (about 63 percent) to lapse for failure to maintenance fees. Office of PTO Spokesperson, Brigid Quinn, Personal Email Communication (Jan. 11, 2001).

thereafter.⁴³ These estimates may be too low.⁴⁴ Other studies find that patents depreciate at higher rates, such as 20 percent per year.⁴⁵

Again, therefore, of the incentives that a patent generates, more are generated by the earlier part of the patent's term than by its later part. Broad claim scope early in a patent's term generates more ex ante incentives than does equally broad claim scope late in a patent's term. Suppose that an inventor were forced to choose between receiving: (1) a lump sum today that represents the expected patent rents attributable to the first half of a patent's term and (2) a lump sum today that represents the expected patent rents attributable to the second half of a patent's term. Most inventors would choose (1), even under the conservative depreciation rates reported by Landes and Posner. Even those conservative rates indicate that the first half of the average patent's term provides two-thirds of the patent's rents. Under a depreciation rate of 20 percent per year, the first four years of the average patent's term provides two-thirds of the rents, and the last four years of the patent's term provides less than one twentieth of the rents. In other words, the incentive to invent is tightly linked to the breadth of patent scope early in the term (early scope) but only loosely linked to the breadth of patent scope late in the term (late scope).

B. The DOE's Social Costs Remain Constant, Rise or Fall More Slowly than Its Social Benefits as the Term Unfolds

⁴³ Landes & Posner, *supra* at 311.

⁴⁴ Landes and Posner extrapolate from data on payment of maintenance fees for US patents. US maintenance fees are due infrequently (three times in 20 years) and are relatively low (\$500-\$3,500). Thus, it is often cheaper for a US patentee to pay the fee for a patent than to determine whether the patent has enough value to justify payment of the fee. *See also* Harold C. Wegner, Bessen-Meurer's *Patent Failure: Keys to 111th Congress Patent Reform*, George Washington U. Law School (May 10, 2008) ("European thought is to have an *annual* maintenance fee with progressively high maintenance fees that make it prohibitive to maintain the enforceable life of a patent throughout the entire patent term *unless the patent is commercially viable.*") Accordingly, estimates based on payment of US maintenance fees understate the true depreciation rate of patents. Also, the Landes and Posner estimate is based on older patents issued in the 1980s and 1990s. *See* Landes & Posner, *supra* (relying on data reported by Mark A. Lemley, Rational Ignorance at the Patent Office, 95 Nw. U. L. Rev. 1495, 1504, note 39 (2001)). Since then, the pace of technological turnover may have accelerated and, in any event, the proportion of issued patents in areas with extra short life-cycles (*e.g.*, software) has increased.

⁴⁵ *See, e.g.*, Pakes & Schankerman, *supra*.

Other things equal, rents generated late in the patent term by Jones’s patch of DOE scope incentivize Jones less than do rents generated early in the term by that same patch of DOE scope.⁴⁶ Meanwhile, Jones’s patch of DOE scope dis-incentivizes subsequent inventors late in Jones’s patent term as much as it dis-incentivizes subsequent inventors early in Jones’s patent term. In other words, while the social benefits of a patch of DOE scope fall with time, the social costs of that patch of DOE scope remain constant.

But this is also true of literal scope. What is different about DOE scope? To exaggerate a bit, literal scope equals certain scope, and DOE scope equals uncertain scope. Uncertain boundaries stymie bargaining and increase notice costs. As a patent term unfolds, the more often the patent’s DOE scope will come into play (relative to the patent’s literal scope).⁴⁷ The proportion of disputes in which the issue of infringement hinges on DOE scope (as opposed to literal scope) grows because, as the term unfolds, technology moves further away from what the patentee contemplated and the DOE is thus more often needed to cover an accused product. The further away the technology is from what the patentee contemplated, the less foreseeable were the rents for exclusive rights to that technology and the less likely it is that the market value of the accused product rests on the patentee’s contribution.

Furthermore, the DOE makes it expensive for competitors to determine whether an obsolete patent is indeed obsolete. Competitors do not use obsolete inventions, by definition. So, at the very end of the day, patents that cover only obsolete inventions

⁴⁶ Do other things remain equal? For our purposes, the question is not whether the link between incentives and patent scope (literal scope plus DOE scope) loosens as the term unfolds but whether the link between incentives *and* DOE scope loosens as the term unfolds. The *magnitude* of the rents attributable to DOE scope (relative to those attributable to literal scope) may very well increase as the term unfolds. As the term unfolds, the proportion of disputes in which infringement hinges on DOE scope (as opposed to on literal scope) grows – because as the term unfolds the DOE is more often needed to cover AAT and other paths outside literal scope that develop with time. In effect, therefore, the DOE lowers a patent’s depreciation rate. *By itself*, the fact that the DOE lowers a patent’s depreciation rate suggests that, relative to literal scope, DOE scope generates *relatively* more rents for its owner as the term unfolds. The question now is whether the DOE’s tendency to generate relatively more rents late in the term is outweighed by the weakness of the link between DOE rents late in the term and ex ante incentives? I believe the latter outweighs the former, but I have not made that case here.

⁴⁷ Is there empirical data on this?

cannot enjoin competitors. These patents nevertheless generate notice costs because competitors must spend money and time to identify them and to determine whether or not they cover only obsolete inventions. By blurring their scope, the DOE increases the expense and uncertainty of the determination – without generating comparable rewards for patentees.

If under current law the DOE's ratio of social benefits to social costs indeed falls as a patent's term unfolds, a compromise based on the term seems in order. I tentatively propose that the DOE be restricted to covering activity that the infringer first began early in the term, for example, within 10 years from the earliest effective filing date of the patent in question.

If this reform were adopted, activity that the infringer first began more than 10 years after the patent's filing date could infringe the patent only if the activity literally infringes the patent. However, if the infringer first began the activity within 10 years of filing and continued (or restarted) the activity after 10 years from filing, the post 10-year activity would infringe under the DOE. The reason for allowing the DOE to cover such post 10-year activity is that, if the infringer first began infringing within 10 years of the filing, the infringer has already incurred (or should have already incurred) the notice costs attributable to the DOE for the patent in question. For this infringer, it is too late to avoid the notice costs. Nor will exempting this infringer from liability for the post 10-year activity avoid most of the administrative costs of litigation. Once the parties are already litigating over DOE infringement for activity that occurred within 10 years of filing, allowing damages for the post 10-year activity does not much raise the costs of lawyering and adjudicating. Lawyering and adjudicating are subject to diminishing returns. Legal fees and adjudicative expenditures are high at start-up and rise logarithmically (ever more slowly) as the stakes rise.⁴⁸

⁴⁸ For patent cases involving stakes of less than \$1 million, one study reports mean legal fees and costs of \$767,000 per side to litigate through trial. *See, e.g.*, AIPLA Report of the Economic Survey 2007. For patent cases involving stakes of greater than \$25 million, the same study reports mean legal fees and costs of \$5.5 million per side to litigate through trial. *Id.* Note that the legal fees and costs increased by a factor of 7, even though the stakes increased by a factor of more than 25.

IV. STAY INJUNCTIONS AGAINST DOE INFRINGEMENT

Under current law, courts usually apply a bright line remedy to DOE infringement — permanent injunction. Yet, DOE scope is inherently blurry. Potential infringers thus face a daunting combination of blurry scope and a harsh remedy for trespassing onto it. They face the harsh remedy of property without the clear boundaries of 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 permanent injunctions. This proposal reflects the middle position of DOE infringement on the continuum between liability rules and property rules. Property rules provide harsh remedies that strongly encourage would-be takers to obtain owners' consent in advance.⁴⁹ 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.

DOE infringement lies intermediate the archetypical domain of property rules and the archetypical domain of liability rules. Compared to real property, identifying DOE scope and bargaining in advance for the right to traverse it is a nightmare. On the other

⁴⁹ See generally Guido Calabresi & A. Douglas Melamed, Property Rules, Liability Rules, and Inalienability: One View of the Cathedral, 85 Harv. L. Rev. 1089 (1972); Louis Kaplow and Steven Shavell, Liability Rules: An Economic Analysis, 109 Harv. L. Rev. 713 (1996); Michael I. Krauss, 3800: Property Rules vs. Liability Rules, Encyclopedia of Law and Economics, B. Bouckaert and G. De Geest (eds.) (1999); Abraham Bell and Gideon Parchomovsky, Pliability Rules, 101 Mich. L. Rev. 1 (2002-03); Ward Farnsworth, Liability Rules v. Property Rules, in *The Legal Analyst: A Toolkit for Thinking about the Law* (U. Chicago Press 2007); Stewart E. Sterk, Property Rules, Liability Rules, and Uncertainty about Property Rights, 106 Mich. L. Rev. 1285 (2008); Christopher M. Newman, Infringement as Nuisance: Avoidance Costs and Accession in Tangible and Intellectual Property, George Mason U. School of Law (2008).

hand, DOE scope is far more identifiable and amenable to bargaining than, say, the levels of precaution adopted by oncoming drivers.

Today this intermediacy of DOE infringement finds no expression in the law. That would change if we guaranteed DOE infringers a modest stay, or grace period, to comply with injunction. A modest stay would not 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 judgment.

What is the social harm of, in effect, granting the DOE infringer a compulsory license that lasts, say, 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, the stay will weaken the patentee's bargaining power, but it will do so mainly to the extent that 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 patents on obvious inventions. If the patented invention is significantly better than its alternatives, the infringer will pay a high royalty to continue using the invention after the stay expires. If the invention is not significantly better than its alternatives, the infringer will pay only a low royalty to continue using the invention after the stay expires.

The *absence* of a stay provides the most leverage for patentees whose patents are ambiguous or trivial. Consider a patent that covers a trivial component of the infringing product. Absent a grace period, the patentee may be able to shut down the infringer's product line. This would not be so problematic if the infringer could have reliably identified and interpreted all relevant patents in advance. But the infringer often cannot. Indeed, the more trivial the patented invention, the less likely that the infringer will have thought it to be a patentable invention that merits a patent search in advance.

To digress for a moment, note the larger implication: other things equal, the closer a patented invention is to being obvious, the higher the odds that someone will not only infringe the patent but do so inadvertently. Not only is a reasonable infringer less likely to search for a patent on a thing that is borderline obvious, the infringer is also more likely to independently invent that thing.

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

Under 35 USC 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*.”⁵⁰ The Federal Circuit has said that these “statutory equivalents” are subject to the same “insubstantial differences” test as the equitable equivalents available under the DOE.⁵¹ Yet, the Federal Circuit distinguishes 112(6) equivalents from DOE equivalents. 112(6) equivalents are said to define the *literal* (!) scope of the claim’s functional language. Further, according to one Federal Circuit opinion, when using the function-way-result test for 112(6) equivalents, the functions must be identical, not merely substantially the same.⁵² Another Federal Circuit opinion says otherwise.⁵³

Can DOE equivalents be applied *on top of* 112(6) equivalents? The cases appear to agree that there can be no double expansion of a functional limitation, no “equivalents of equivalents.” Yet, as a conceptual matter, it is not readily clear why the Federal Circuit forbids DOE equivalents of 112(6) equivalents. 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 *alongside* 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).⁵⁴

⁵⁰ 35 USC 112(6) [emphasis added].

⁵¹ See *Chiuminatta Concrete Concepts Inc. v. Cardinal Indus.*, 145 F.3d 1303, 1309 (Fed. Cir. 1998)

⁵² See *Al-Site Corp. v. VSI Intern Inc.*, 174 F.3d 1308, 1321 n.2 (Fed Cir 1999)

⁵³ See *Interactive Pictures Corp. v. Infinite Pictures, Inc.*, 274 F.3d 1371, 1381-82 (Fed. Cir. 2001).

⁵⁴ *Id.*; *NOMOS Corp. v. BrainLab USA Inc.*, 357 F.3d 1364, 1369 (Fed. Cir. 2004)..

In *Al-Site v. VSI* (Fed Cir 1999), 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.⁵⁵ 112(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 112(6).⁵⁶ 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.⁵⁷ To decide whether to apply the law of 112(6) equivalents or the law of DOE equivalents, the court must first determine whether the technology corresponding to the claim’s functional language qualifies as after-arising. The answer is not always straightforward.⁵⁸ Furthermore, claims with functional limitations typically also 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

⁵⁵ *Al-Site, supra*. “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.” *Id.* [emphasis added]

⁵⁶ Imagine a claim that recites “An athletic shoe comprising... a means for detachably fastening said left upper portion to said right upper portion.” The specification discloses laces, buttons, hooks and zippers as means for detachably fastening. Velcro is invented years later. Under *Al-Site*, Velcro could not be a 112(6) equivalent but could be a DOE equivalent.

⁵⁷ See also Cyrill P. Rigamonti, *Conflicting Theories of Equivalence: 35 USC 112(6) in the Supreme Court and the Federal Circuit*, 40 IDEA 163 (2000).

⁵⁸ See examples in *Collins, supra*.

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) and nowhere else.⁵⁹ Though logical, this rationale puts too fine a point on the matter. And there is no evidence that Congress or the drafters of the Patent Act intended that 112(6) equivalents be treated differently.⁶⁰ We should simply treat 112(6) equivalents the same as DOE equivalents.⁶¹

VI. REEVALUATE PROSECUTION HISTORY ESTOPPEL

Under the doctrine of prosecution history estoppel (PHE), the DOE cannot cover what a patentee surrendered to obtain the claim. The doctrine of 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.

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.⁶² If the patentee rebuts (1), the amendment does not bar equivalents. If the patentee cannot rebut (1), he may still capture equivalents ranging as far as the extent to which he rebuts (2). 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.

⁵⁹ See Rigamonti, *Id.*

⁶⁰ Rigamonti, *supra*

⁶¹ *But see* Rigamonti, *supra* (for functional limitations, the DOE should be applied not to the claim language per se but to the structure disclosed in the specification that corresponds to the claim language).

⁶² *See Festo II, supra.*

Jay Thomas argues that the doctrine of PHE is not worth the candle and that we should ignore the prosecution history.⁶³ First, he argues, in most areas of the law estoppel requires detrimental reliance. 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. 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. If it did not exist, accused infringers would seldom rely on the prosecution history.

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

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 over-reaching, patent examination would become more difficult and patents would become less reliable records for the public at large.

Thomas 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.⁶⁴

⁶³ See John R. Thomas, On Preparatory Texts and Proprietary Technologies: The Place of Prosecution Histories in Patent Claim Interpretation, 47 UCLA L. Rev. 183 (1999); John Thomas, Presentation: A Case Against Using the Doctrine of Equivalents and Prosecution History Estoppel, CASRIP Publication Series: Rethinking Intellectual Property 97-100 (No.6) (2000).

⁶⁴ “Let us look objectively at the prior art. Who cares what the applicant says? His opinion does not matter. We are not interested in the intentions of the applicant. What we want to know is what the instrument says, what the *content* of the prior art is.” Thomas, A Case Against Using, *supra* at 99.

This argument is also compelling but ultimately fails. 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 behind 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, we should care about what applicants say because what they say affects the chances that the claims they want will issue. That is, we should police what applicants say because what they say affects what examiners do.

Of course, the doctrine of PHE has its costs. It complicates infringement analysis,⁶⁵ which directly increases the costs of patent clearance, licensing and litigation. Further, examiners often rely on PHE itself. Examiners often think it sufficient to 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.⁶⁶ The doctrine of 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, say, criminal punishment promotes efficiency net of the costs of apprehending and incarcerating criminals.

It is harder to conclude, however, that the doctrine will remain beneficial in the future. The overall process of patent acquisition is becoming more adversarial. Inter

⁶⁵ “[W]e are creating wheels within wheels of elaborate doctrine to try to figure out when there is an estoppel.” *Id.*

⁶⁶ *But Cf.* Mark Lemley, Rational Ignorance at the Patent Office.

partes reexamination is now available and the US will may soon adopt more liberal means of post-grant review.⁶⁷ By deterring applicants from overreaching, these adversarial processes serve as at least partial substitutes that can take over some of the police work that the doctrine of 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 from, findings of inequitable conduct.⁶⁸ Both PHE and inequitable conduct discourage applicants from overreaching during ex parte prosecution. If reform of inequitable conduct renders inequitable conduct less threatening to applicants, the doctrine of PHE may for that reason become more socially valuable — because it can take over some of the police work that inequitable conduct performs today.

More useful is to ask whether we can reform the doctrine of PHE to improve its ratio of costs to benefits. Below are some preliminary thoughts.

Patent Failure shows us that, in general, we need more bright lines, especially bright lines that facilitate bargaining in advance of R&D or commercialization.⁶⁹ 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 verdicts that seem *wrong* under the oddball facts before us in individual cases.

In deference to the notice function of claims, the Federal Circuit set forth a bright line in *Festo I*.⁷⁰ 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, that the amendment was unrelated to the purported

⁶⁷ See (Proposed) Patent Reform Act of 2007, S.1145 (Sections 5 and 7), HR.1908 (Sections 6 and 9).

⁶⁸ (Proposed) Patent Reform Act of 2007, S.1145 (Sections 11-12), HR.1908 (Section 11).

⁶⁹ But cf. John R. Thomas, Formalism at the Federal Circuit, 52 Am. U. L. Rev. 771 (2002-03).

⁷⁰ See *Festo I*, *supra*.

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 is curtailed in the ways that I or others propose, there will be less DOE scope 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 DOE scope 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 DOE scope 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.⁷¹ The mismatch may also be inefficient. If any narrowing amendment of any magnitude kills all DOE scope, applicants will respond in several ways. Some will go to great lengths to avoid amending claims after filing. These applicants will 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 will 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. Other applicants will 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.

⁷¹ Cite

More thought, and perhaps more 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.

VII. 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.⁷² Indeed, rarely does a patentee even allege that the infringer copied.⁷³ Furthermore, according to Bessen and Meurer, accused infringers tend to spend more on R&D than do the patentees who sue them.⁷⁴ 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 if there were no patent system at all.

If the authors' data holds up under scrutiny, dramatic reform should follow. Even if the revised figures are less damning 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 most things 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 reforms that I propose may not tame the DOE enough. The DOE

⁷² See *infra*, note X.

⁷³ *Id.*

⁷⁴ *Id.*

needs a lot of work.⁷⁵ The doctrine of prosecution history estoppel is not the only legal limit on DOE scope that needs to be re-assessed.⁷⁶ Some of the legal limits seem inconsistent with each other, some seem redundant, and some seem to create perverse incentives.⁷⁷ Unsurprisingly, the courts apply them ad hoc.⁷⁸

The tests for technological equivalence⁷⁹ also need to be reassessed. For one thing, it would be nice to settle on a single test. If we settle on the most popular test, the function-way-result test, it would also be nice to know how its function prong differs from its result prong.⁸⁰ 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 standard definition of the word “function” is “the purpose for which something is designed or exists.” The standard definition seems to imply that referring to a

⁷⁵ Cf. Judge Paul R. Michel, *The Role and Responsibility of Patent Attorneys in Improving the Doctrine of Equivalents*, 40 IDEA 123 (2000) (the DOE “has proven to be the most difficult and least predictable of all doctrines in patent law to apply”); Joshua D. Sarnoff, *Abolishing the Doctrine of Equivalents and Claiming the Future after Festo*, 19 Berkeley L. J. 1157 (2004).

⁷⁶ See, e.g., *Id.*; John Mills, *Three “Non-obvious” Modifications to Simplify and Rein in the Doctrine of Equivalents*, 14 Fed. Cir. B. J. 649 (2004-05); Jeremy T. Marr, *Foreseeability as a Bar to the Doctrine of Equivalents*, 2003 B.C. Intell. Prop. & Tech. F. 103101 (2003). But cf. Paul M. Janicke, *On the Causes of Unpredictability of Federal Circuit Decisions in Patent Cases*, 3 NW J. Tech. & Intell. Prop. 93 (2005).

⁷⁷ 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. 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.

⁷⁸ One can get a feel for the ad hoc jurisprudence of the legal limits by comparing *Graver Tank*, *supra*, to *Johnson & Johnston*, *supra*, and by comparing *Pennwalt Corp. v. Durand-Wayland Inc.* 833 F.2d 931 (Fed. Cir. 1987) to *Corning Glass*, *supra*.

⁷⁹ The judge determines legal equivalence. The jury, or the judge in a bench trial, determines technological (or factual) equivalence. See *Graver Tank*, *supra*.

⁸⁰ Under the function-way-result test, 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. See *Graver Tank*, *supra*.

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thing's function is merely a way of referring to the result achieved by the thing. Is this three-prong test really a two-prong test?