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Pioneers versus Improvers: Enabling Optimal Patent Claim Scope

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NOTE

PIONEERS VERSUS IMPROVERS: ENABLING OPTIMAL PATENT CLAIM SCOPE

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INTRODUCTION: THE INHERENT TRADEOFF BETWEEN PIONEERS AND IMPROVERS

The classic justification[1] for patents is intuitive: patents are a necessary evil for combating the public goods nature of information.[2] Unlike tangible property, ideas can be freely copied and used by others without interfering with anyone else's use.[3] In the absence of patents, competitors would cheaply replicate inventions, free-riding on the extensive research and development (R&D) investments made by inventors. Having avoided R&D costs, competitors could then undersell the original inventor; inventors would seldom recover their investments,[4] and inefficiently few inventions would be developed. To combat this inefficiency, the patent system rewards an inventor with an exclusive right to her invention, allowing her to profit from her investment. Thus, the prospect of a patent creates an ex ante incentive that encourages inventors to invest more efficiently—from society's perspective—in the development of

1. Both courts and commentators regard this Incentive Theory as "the standard economic explanation" for intellectual property. *See, e.g.*, Mark A. Lemley, *Ex Ante Versus Ex Post Justifications for Intellectual Property*, 71 U. CHI. L. REV. 129, 129 (2004); Mazer v. Stein, 347 U.S. 201, 219 (1954) (holding that the economic justification for granting patents "is the conviction that encouragement of individual effort by personal gain is the best way to advance public welfare").

2. *See* Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, *in* THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS 609, 614–16 (Richard R. Nelson ed., Nat'l Bureau of Econ. Research 1962). Public goods exhibit two key characteristics: (1) consumption of the good by one individual does not reduce availability of the good for consumption by others; and (2) no one can be effectively excluded from using the good. Inventions have qualities of a public good because one person's use of the invention does not diminish others' ability to use it, and absent patent protection, once an idea becomes public, its inventor cannot exclude others from using it.

3. *See* ROBERT P. MERGES, PETER S. MENELL & MARK A. LEMLEY, INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE 10–18 (3d ed. 2003) (discussing the public good qualities of intellectual property).

4. Theoretically, some inventors could recoup their investments by capitalizing on a first-mover advantage or on network effects. *See id.* In other cases, non-financial benefits may provide sufficient incentives to invent. *See* Yochai Benkler, *Coase's Penguin, or, Linux and the Nature of the Firm*, 112 YALE L.J. 369, 424–26 (2002) (discussing the open source movement).

new ideas.[5] But this classic explanation has a critical caveat: patent rights can also *discourage* innovation.[6] If the scope of exclusive rights is too broad, patents inefficiently impede follow-on innovation that requires use of a patented work.[7] As one commentator cautions, "[d]iscourage improvements too strongly, and you will freeze development at the first generation of products."[8]

New inventions invariably rely on old ideas. While many patentees are willing to license their rights, they are under no obligation to do so.[9] This is especially problematic because so-called "improvements" often "dwarf the original work in terms of their practical significance."[10] Even when licensing is possible, improvers incur substantial costs in identifying potential patent owners, determining whether their improvement is infringing, and negotiating licensing arrangements. An improver further runs the risk of unwittingly infringing a patent that she fails to uncover.[11] Moreover, overbroad patent scope can have a "chilling effect on others who may actually be investigating how to create [a] *prophetically*

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5. *See* Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 480 (1974) ("The patent laws promote . . . progress by offering a right of exclusion for a limited period as an incentive to inventors to risk the often enormous costs in terms of time, research, and development.").

6. *See* FED. TRADE COMM'N, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY ch. 4 at 21 (2003), *available at* http://www.ftc.gov/os/2003/10/innovationrpt.pdf ("If breadth is defined too broadly—that is, more broadly than is truly enabled—products that should be free to compete instead will infringe, and unwarranted market power may result.").

7. *See* Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, 997–98 (1997) (noting that countless economists have demonstrated that "efficient creation of new works requires access to and use of old works"); Suzanne Scotchmer, *Standing on the Shoulders of Giants: Cumulative Research and the Patent Law*, 5 J. ECON. PERSP. 29, 30–35 (1991); Lemley, *supra* note 1, at 130.

8. Lemley, *supra* note 7, at 990.

9. *See* Cont'l Paper Bag Co. v. Eastern Paper Bag Co., 210 U.S. 405, 424 (1908). Moreover, economic theory dictates that in many cases, licensing would be irrational because competition from licensees would reduce the patentee's ability to charge supracompetitive prices.

10. Lemley, *supra* note 7, at 997 (discussing how access to old works benefits dynamic market efficiency in such cases).

11. There are various reasons why an improver may not come across a patent: (1) patent applications are not published until 18 months after filing; (2) researchers tend to rely on alternate sources of information; and (3) companies in certain industries simply ignore patents. *See* 35 U.S.C. § 122; Wesley M. Cohen et al., *R&D Spillovers, Patents and the Incentives to Innovate in Japan and the United States*, 31 RES. POL'Y 1349, 1362–64 (2002) (suggesting through empirical research that scientists do not learn much from patents and rely on other sources instead); Mark A. Lemley, *Ignoring Patents*, 2008 MICH. ST. L. REV. 19, 21–22 ("[B]oth researchers and companies in component industries simply ignore patents. Virtually everyone does it. . . . Companies and lawyers tell engineers not to read patents in starting their research, lest their knowledge of the patent disadvantage the company by making it a willful infringer. . . . Nor do they conduct a search before launching their own product.").

claimed invention when the inventor herself may not be able to do so."[12] Thus, a patent system entails an unavoidable tradeoff between incentivizing pioneering inventions and subsequent improvements; though the prospect of a broad patent may provide stronger incentives for creation and commercialization of new developments, its scope reduces incentives for other inventors to improve upon that work.[13]

In their seminal article on patent scope, Robert Merges and Richard Nelson conclude that patent law should "attempt at the margin to favor a competitive environment for improvements, rather than an environment dominated by the pioneering firm."[14] They further suggest that scope doctrines should be used to optimize claim breadth, with a focus on retaining incentives for subsequent improvers.[15]

Enablement is one such scope doctrine.[16] Arising most commonly as a defense to an infringement claim, enablement requires a patent to describe the claimed invention in sufficient detail to permit a person having ordinary skill in the relevant field to replicate and use the invention without needing to engage in "undue experimentation."[17] If a patent claim is not "enabled"—i.e., if a person having ordinary skill in the art (PHOSITA) who studied the patent cannot make or use the invention without undue experimentation—the claim is invalid and can no longer be asserted. This penalty deters patent applicants from claiming more

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12. Timothy R. Holbrook, *Possession in Patent Law*, 59 SMU L. REV. 123, 158 (2006) (emphasis added). Prophetically claimed inventions are "forms of the invention that the patentee did not actually invent but which would be within the scope of her disclosure." *Id.*

13. *See* Scotchmer, *supra* note 7, at 30 ("The challenge is to reward early innovators fully for the technological foundation they provide to later innovators, but to reward later innovators adequately for their improvements and new products as well.").

14. Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 843–44 (1990) (surveying historical examples in various industries to assess the effect of patent scope on the rate of technical advance).

15. *Id.* at 916.

16. *Id.* at 845 (describing enablement and the doctrine of equivalents as primary doctrines affecting claim scope). *See* Enzo Biochem, Inc. v. Gen-Probe Inc., 323 F.3d 956, 982 (Fed. Cir. 2002) ("[Enablement] serves to limit claim scope thus demarking the boundary between pioneer inventions and patentable improvements."); Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1593–94 (2003) ("[P]atent claims are invalid if they are not fully described and enabled by the patent specification, so the permissible breadth of a patent will be determined by how much information the court determines must be disclosed to enable one of ordinary skill in the art to make and use the patented invention."); Robert M. Hunt, *Economics and the Design of Patent Systems*, 13 MICH. TELECOMM. TECH. L. REV. 457, 464 (2007) ("It is clearly most important to modify the patent process to ensure that there is a closer relationship between what a firm invents and the property rights" which may require "modifications to patent law's . . . enablement requirement[].").

17. Nat'l Recovery Techs., Inc. v. Magnetic Separation Sys., Inc., 166 F.3d 1190, 1196 (Fed. Cir. 1999) (holding that the scope of the patent right must "be less than or equal to the scope of the enablement"); *In re* Wands, 858 F.2d 731, 736–37 (Fed. Cir. 1988) (discussing what constitutes "undue experimentation").

than they invented and allows others to develop improvements without fear of infringement.

Unfortunately, the enablement doctrine is in disarray. Scholars have lambasted recent Federal Circuit decisions that apply seemingly inconsistent tests for determining whether a claim is enabled.[18] These complaints, however, are just one piece of a larger problem: the enablement doctrine incorporates an assortment of moving parts, and scholars, as well as the Federal Circuit, have not considered how these parts interact as a whole.

This Note introduces a cohesive treatment of the enablement doctrine and in doing so, seeks to calibrate the doctrine so that it more properly strikes the balance between pioneers and improvers. To this end, Part I introduces the tests that have troubled scholars and highlights these tests' apparent inconsistencies. Part II proffers a theory that reconciles the tensions in the fragmented case law by expanding patentees' obligations under the enablement requirement. This may appear to have harsh effects, as failure to enable carries the penalty of invalidating the patentee's claim. As I will argue, this is a necessary consequence because the alternative would expand the scope of the patentee's rights beyond her invention, providing her with a windfall at the expense of both improvers and (more significantly) society. These benefits justify the proposed standard, but we need not accept its costs without mitigation.

Part III introduces and defends three reforms motivated by an understanding of the costs associated with the standard proposed in Part II. First, the Federal Circuit should reconsider its approach to "undue experimentation." To be an effective policy lever, enablement doctrine must account for an array of factual considerations which affect the ease with which skilled persons can make and use the claimed invention, i.e., whether undue experimentation is required. Recognizing this, the Federal Circuit established a multi-factor test for undue experimentation, known as the *Wands* factors.[19] Courts, however, are not required to consider the *Wands* factors. Consequently, many courts—including subsequent Federal Circuit panels—have come to rely on just one of these factors as a proxy for the entire multi-factor test. This shortcut leads to outdated views of the PHOSITA and hindsight bias, which

18. *See, e.g.*, Bernard Chao, *Rethinking Enablement in the Predictable Arts: Fully Scoping the New Rule*, 2009 STAN. TECH. L. REV. 3, ¶ 5.

19. In *In re Wands*, the Federal Circuit set forth eight factors that courts may consider in determining whether undue experimentation is required. 858 F.2d at 736–37. *See infra* note 37.

contaminate courts' enablement analysis.[20] To avoid this result, the Federal Circuit should reemphasize the role of the PHOSITA and mandate consideration of the *Wands* factors.

Second, the Federal Circuit should resurrect the moribund maxim that claims should be construed narrowly when such construction is necessary to preserve their validity. This maxim would allow courts and parties to litigation to tailor claims to their proper scope as an alternative to the all-or-nothing course of invalidation. Thus, while a patentee's obligations under the proposed enablement standard would be greater, so too would her ability to salvage her claims in the face of a successful enablement defense. Moreover, this option would promote a closer relationship between what a patentee invents and the scope of her patent rights.

Finally, current enablement doctrine fails to adequately address the relationship between enablement and later-developed technology. To obtain patent protection, a patentee must enable the embodiments of her invention which fall within the scope of her claims. A critical but unresolved issue is how to treat embodiments that become possible only as a result of technology which arises after the patent application is filed. Because enablement is measured at the time of filing, embodiments that are made possible only after advancements in the art need not be enabled.[21] There is no controversy here. In some cases, however, the Federal Circuit has allowed patent claims to extend to technology developed after filing; in other circumstances, it has declined to do so. This approach inappropriately allows some applicants to capture an invention that they most likely never conceived and "certainly ha[ve] not enabled."[22] This final reform disentangles the inconsistent case law and proposes policy levers for isolating after-arising technologies which merit protection from those that do not.

I. THE APPARENT INCONSISTENCIES IN THE CURRENT FRAMEWORK

A. *Patent Claim Scope*

A patent application has two main parts: the specification and a set of claims.[23] The specification describes the problem the inventor faced

20. *See* Dan L. Burk & Mark A. Lemley, *Is Patent Law Technology-Specific?*, 17 BERKELEY TECH. L.J. 1155, 1199–1200.

21. *See In re* Hogan, 559 F.2d 595, 605–06 (C.C.P.A. 1977).

22. Chiron Corp. v. Genentech, Inc., 363 F.3d 1247, 1263 (Fed. Cir. 2004) (Bryson, J., concurring) (explaining his disagreement with the majority's reasoning and why he would have held that the patent did not enable the after-developed technology).

23. 35 U.S.C. § 112 (2010).

and how the claimed invention solves that problem. It also contains a detailed description of the invention, including how it is made and used.[24] Patent protection, however, is not limited to the particular embodiments of the invention that the patentee actually built or those which she disclosed in her specification.[25] Rather, the scope of the patent right is defined by claims, which set forth the subject matter that the patentee regards as her invention.[26] In this respect, patent claims are similar to the "metes and bounds" of a real property deed, "distinguishing the inventor's intellectual property from the surrounding terrain."[27] The claims establish a conceptual perimeter around the invention, known as claim scope. A defendant's product literally infringes the patent if it falls within this scope.[28] Therefore, an inventor would like the broadest claim scope possible, subject to doctrinal limits, because she can thereby assert her claim against a broader range of infringing products. Doctrinal limitations on claim scope include the novelty[29] and nonobviousness[30] requirements which prevent a claim from covering something already invented or an obvious extension of an existing work. On the other hand, the enablement doctrine requires that the patentee teach the PHOSITA how to make and use the entire scope of a claim.[31]

B. *The Enablement Doctrine*

A patent's specification must describe "the manner and process of making and using [the invention] in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains . . . to make and use" the invention.[32] Early on, the Supreme Court recognized that "some inventions cannot be practiced without adjustments being made to adapt them to the particular context."[33] Accordingly, courts have recognized that a claim may still be enabled even though some experimentation is required.[34] Thus, the enablement requirement is met if the

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24. *Id.*

25. Otherwise, imitators could escape infringement by making insignificant changes to the patentee's embodiments, rendering patents virtually worthless. *See* Clark Blade & Razor Co. v. Gillette Safety Razor Co., 194 F. 421, 423 (3d Cir. 1912).

26. Innova/Pure Water, Inc. v. Safari Water Filtration Sys., 381 F.3d 1111, 1115 (Fed. Cir. 2004).

27. Merges & Nelson, *supra* note 14, at 845.

28. Graver Tank & Mfg. Co. v. Linde Air Products Co., 339 U.S. 605, 607 (1950).

29. 35 U.S.C. § 102 (2010).

30. 35 U.S.C. § 103 (2010).

31. 3 DONALD S. CHISUM, CHISUM ON PATENTS § 7.03 (2008).

32. 35 U.S.C. § 112 (2010).

33. CHISUM, *supra* note 31, at § 7.03(4) (discussing Minerals Separation v. Hyde, 242 U.S. 261 (1916)).

34. *See, e.g.*, Monsanto Co. v. Scruggs, 459 F.3d 1328, 1338 (Fed. Cir. 2006) ("The fact that *some* experimentation may be necessary to produce the invention does not render [a]

specification's disclosure permits PHOSITA to practice the claimed invention without "undue experimentation."[35] A significant amount of experimentation is "permissible if it is merely routine, or if the specification . . . provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed."[36]

In *In re Wands*, the Federal Circuit set forth eight factors that courts may consider in determining whether experimentation is undue:

> (1) the quantity of experimentation necessary; (2) the amount of direction or guidance presented; (3) the presence or absence of working examples; (4) the nature of the invention; (5) the state of the prior art; (6) the relative skill of those in the art; (7) the predictability or unpredictability of the art; and (8) the breadth of the claims.[37]

Thus, in theory, enablement turns on "a factually intensive inquiry regarding the amount of experimentation required."[38] In practice, however, many decisions after *Wands* focus almost entirely on the issue of predictability.[39]

Predictability is surely a worthy consideration in evaluating enablement, and by extension, optimal claim scope. In its report on promoting innovation, the Federal Trade Commission explained the relationship between predictability, experimentation, and claim scope as follows:

> When considerable experimentation is necessary, follow-on innovation is likely to be costly; the more stringent enablement requirements that follow from greater need to experiment reduce the breadth of the initial innovator's patent, and expand the rewards potentially available to follow-on innovators. Similarly, less predictability makes follow-on innovation more costly; again the more stringent enablement requirements that follow

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patent invalid for lack of enablement."); *In re* Vaeck, 947 F.2d 488, 495 (Fed. Cir. 1991) ("That *some* experimentation may be required is not fatal; the issue is whether the amount of experimentation required is 'undue.' ").

35. *See In re* Wands, 858 F.2d 731, 737 (Fed. Cir. 1988).

36. *Id.*

37. *Id.*

38. AK Steel Corp. v. Sollac, 344 F.3d 1234, 1245 (Fed. Cir. 2003) (citing Wands, 858 F.2d at 737). *But see* Amgen, Inc. v. Chugai Pharm. Co., 927 F.2d 1200, 1213 (Fed. Cir. 1991) ("[I]t is not necessary that a court review all the *Wands* factors to find a disclosure enabling. They are illustrative, not mandatory."). Though based on underlying factual considerations, enablement is ultimately a legal determination. *Wands*, 858 F.2d at 737.

39. *See, e.g.*, Spectra-Physics, Inc. v. Coherent, Inc., 827 F.2d 1524, 1533 ("If an invention pertains to an art where the results are predictable, . . . a broad claim can be enabled by disclosure of a single embodiment, and is not invalid for lack of enablement simply because it reads on another embodiment of the invention which is inadequately disclosed.") (citation omitted); Adang v. Fischhoff, 286 F.3d 1346, 1356–58 (Fed. Cir. 2002).

> reduce the breadth of the initial patent and provide opportunities for expanded follow-on rewards. These results are in line with the economic reasoning for settings in which initial innovation is inexpensive and follow-on innovation is costly . . . .[40]

But by focusing fundamentally on predictability, the Federal Circuit has seemingly established multiple enablement standards which it has failed to reconcile.

C. *An Assortment of Articulations*

Commentators have identified as many as three separate enablement standards applied by the Federal Circuit: (1) the "full scope rule"; (2) the "single embodiment rule"; and (3) the "blended rule."[41] This section lays out the contours of these standards and highlights their apparent inconsistencies.

1. The Full Scope Rule

Liebel-Flarsheim Co. v. Medrad exemplifies the full scope rule, which requires that the specification enable "one of ordinary skill in the art to practice the full scope of the claimed invention" without undue experimentation.[42] Liebel's claims were drawn to a front-loading fluid injector system with a replaceable syringe capable of withstanding high pressure. The specification disclosed an injector with a pressure jacket, but the asserted claims had no pressure jacket limitation. Meanwhile, Medrad developed an improved injector system that functioned without a pressure jacket. At the district court and on appeal at the Federal Circuit, Medrad proposed a narrow claim construction, arguing that if construed broadly to encompass jacketless embodiments, the claims would be invalid for lack of enablement. Citing *Phillips v. AWH Corp.*, the Federal Circuit refused to adopt the narrower construction,

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40. FED. TRADE COMM'N, *supra* note 6, ch. 4, at 24.

41. *See* Chao, *supra* note 18, at ¶¶ 21–32; Sean B. Seymore, *The Enablement Pendulum Swings Back*, 6 NW. J. TECH. & INTELL. PROP. 278, 280, 284 (discussing "single embodiment" and "full scope" enablement). Bernard Chao identifies three tests: (1) the "single embodiment rule"; (2) the "full scope rule"; and (3) the "blended rule." *See* Chao, *supra* note 18, at ¶¶ 51–52. For the sake of consistency, I borrow Chao's terminology. Chao also identifies a fourth test, the "*Wands* rule," which is discussed *supra* Part I.B. and *infra* Part III.

42. 481 F.3d 1373, 1380 (Fed. Cir. 2007). *Liebel-Flarsheim* is the first in a line of recent Federal Circuit enablement decisions that focus on whether the "full scope" of a claim was enabled. This approach was adopted in *Automotive Technologies International, Inc. v. BMW of North America*, 501 F.3d 1274 (Fed. Cir. 2007), and *Sitrick v. Dreamworks, L.L.C.*, 516 F.3d 993 (Fed. Cir. 2008). These three decisions trace their doctrinal lineage to *AK Steel Corp. v. Sollac*, in which the Federal Circuit held that "the applicant's specification must enable one of ordinary skill in the art to practice the *full scope* of the claimed invention." 344 F.3d 1234, 1244 (Fed. Cir. 2003) (emphasis added).

determining that a court could only construe claims to preserve validity after exhausting all other tools for claim construction.[43] After accepting Liebel's broader construction, the Federal Circuit held the claims invalid for failure to enable a fluid injector without a pressure jacket. This decision turned largely on three findings: (1) the application described only an injector system with a pressure jacket and provided no guidance on how to implement a jacketless system; (2) by the inventors' own admission, they were unable to produce a jacketless system; and (3) the specification disparaged jacketless systems, calling them "expensive and therefore impractical."[44]

Citing *Spectra-Physics, Inc. v. Coherent, Inc.* and *Engel Industries, Inc. v. Lockformer Co.*, Liebel argued that by enabling one mode of making and using the invention—the jacketed embodiment—it satisfied the enablement requirement and "the inquiry should end there."[45] The Federal Circuit distinguished the cited cases, however, as ones in which disclosure of one embodiment allowed one skilled in the art to make and use the invention as broadly as it was claimed. In those cases, the court claimed, the specification did not need to "describe how to make and use every embodiment of the invention 'because the artisan's knowledge of the prior art and routine experimentation [could] fill in the gaps.'"[46] Thus, the full scope rule requires a patentee to disclose enough for a PHOSITA to practice *all* of a claim's embodiments using her skill, knowledge of the art, and routine experimentation.[47]

2. The Single Embodiment Rule: Enabling Just One Embodiment is Sufficient

The single embodiment rule's origins have been traced to *Engel Industries, Inc. v. Lockformer Co.*, in which the court's principal concern was whether the patentee satisfied the best mode requirement.[48] In an attempt to distinguish the best mode and enablement requirements, the court stated that "[t]he enablement requirement is met if the description enables *any* mode of making and using the claimed invention."[49] As one commentator put it, "if *Engel* stood by itself, it probably could be over-

43. Phillips v. AWH Corp., 415 F.3d 1303, 1327 (Fed. Cir. 2005).

44. *Liebel-Flarsheim*, 481 F.3d at 1379.

45. *Id. See also infra* Parts I.C.2 & I.C.3 (discussing *Engel* and *Spectra-Physics*).

46. *Liebel-Flarsheim*, 481 F.3d at 1380.

47. The full scope rule thereby contemplates the *Wands* factors for undue experimentation.

48. 946 F.2d 1528 (Fed. Circ. 1991). *See* Chao, *supra* note 18, at ¶ 28 (tracing the origins of the single embodiment rule).

49. *Engel*, 946 F.2d at 1533 (emphasis added).

looked as a poorly considered outlier," but several subsequent Federal Circuit decisions have cited *Engel* for the above rule.[50]

In *Johns Hopkins University v. CellPro, Inc.*, the claimed technology was a genus of monoclonal antibodies which bind to a particular antigen.[51] The district court found Johns Hopkins' patent enabled on summary judgment.[52] Before the Federal Circuit, CellPro argued that the broad genus of claimed antibodies was not enabled because the specification disclosed only the means for producing the *preferred* antibody.[53] CellPro further contended that no one ever succeeded in making a narrower class of antibodies using either of the alternative methods disclosed in the specification.[54] Quoting *Engel*, the Federal Circuit rejected the second argument "because the enablement requirement is met if the description enables any mode of making and using the invention."[55] Thus, CellPro could only establish non-enablement by showing that *none* of the disclosed modes were sufficiently enabled.[56] Curiously, the court never addressed CellPro's first contention—that the broad genus claim was not enabled by disclosure of a single embodiment. The failure to recognize this argument is especially puzzling because the Federal Circuit quoted one of its previous decisions for the proposition that "the specification of a patent must teach those skilled in the art how to make and use the *full scope* of the claimed invention without undue experimentation."[57] Thus, in this case, the Federal Circuit recited both the single embodiment and full scope rules but seemingly applied one and ignored the other.

The outcome of *Invitrogen Corp. v. Clonetech Labs, Inc.*[58] is similarly perplexing. Defendant Clonetech argued that the claims—which were drawn to a genetically engineered reverse transcriptase (RT)—were not enabled because the applicant disclosed only one method of producing the RT.[59] As in *CellPro*, the Federal Circuit recited the full scope

50. Chao, *supra* note 18, at ¶ 29. *See, e.g.*, CMFT, Inc. v. Yieldup Int'l Corp., 349 F.3d 1333, 1338 (Fed. Cir. 2003); Amgen Inc. v. Hoechst Marion Roussel, Inc., 314 F.3d 1313, 1335 (Fed. Cir. 2003); Johns Hopkins Univ. v. CellPro, Inc., 152 F.3d 1342, 1361 (Fed. Cir. 1998).

51. 152 F.3d at 1342.

52. *Id.* at 1358.

53. *Id.* at 1359.

54. *Id.* at 1361.

55. *Id.*

56. *Id.* ("CellPro can carry its burden only by showing that all of the disclosed alternative modes are insufficient to enable the claims.").

57. *Id.* at 1359 (emphasis added) (quoting Genentech, Inc. v. Novo Nordisk A/S, 108 F.3d 1361, 1364 (Fed. Cir. 1997)).

58. 429 F.3d 1052 (Fed. Cir. 2005).

59. *Id.* at 1070. Clonetech produced RT by point mutation and argued that the specification only disclosed how to make RT using deletion mutation. *Id.*

rule[60] before applying the single embodiment test and finding the claims enabled.[61]

One way to understand *Invitrogen* is to view the single embodiment rule as limited to species claims that are drawn to a particular composition of matter.[62] Species claims are those that cover only one entity. The claim in *Invitrogen* would traditionally be considered a species claim since it is drawn to a single entity: genetically engineered RT.[63] If a claim is understood to cover a single entity, its scope therefore contains only one embodiment. Consequently, adequate disclosure of "any mode of making and using" that one embodiment—which is the "invention"—enables the PHOSITA to practice the full scope of the claim. From this standpoint, the "single embodiment" rule seems rather innocuous. But is it really? As Jeffrey Lefstin explains, "there is no such thing as a 'species' claim, for claims are never restricted to a physical entity. Insofar as both genus and species are abstractions, the difference between the two is less in kind and more in degree."[64] *Invitrogen* and *CellPro* indicate that at least some embodiments of the invention—those made by an alternate process—need not be enabled.

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60. *Id.* ("Section 112 requires that the patent specification enable 'those skilled in the art to make and use the full scope of the claimed invention.' ") (citations omitted).

61. *Id.* at 1071 ("The enablement requirement is met if the description enables any mode of making and using the claimed invention.") (quoting *CellPro*, 152 F.3d at 1361).

62. This interpretation brings the single embodiment rule in line with pre-Federal Circuit case law. *See* Schering Corp. v. Gilbert, 153 F.2d 428 (2d Cir. 1946); Maurer v. Dickerson, 113 F. 870, 874 (3d Cir. 1902) ("[T]he claim is not restricted to the product made by the described process, but covers the chemical *individual*, however produced.") (emphasis added).

63. *But see* Jeffrey A. Lefstin, *The Formal Structure of Patent Law and the Limits of Enablement*, 23 BERKELEY TECH. L.J. 1141, 1169 (2008) (explaining that "essentially all patent claims . . . are genus claims").

64. *Id.* at 1169–70. Lefstin illustrates this point with a hypothetical claim to a chair:

> Consider a simple claim to a chair having four legs:
>
> *1. An object for supporting a human body, comprising a substantially flat surface sized to accommodate a human posterior, and four legs supporting said surface.*
>
> This claim is unremarkable and, supposing the inventor to be the first to conceive of the idea of a chair with four legs, we would not think this claim poses any issue of adequate disclosure. Yet this claim, even more so than the typical chemistry or biotechnology claim, covers an infinite variety of embodiments. Like nearly all patent claims, this claim is written in the so-called 'open' format, employing the word "comprising." Such claims are construed to cover all things that possess the recited properties. Subject matter with *additional* properties or elements still falls within the scope of the claim, so long as it retains those properties recited by the claim. Thus chairs made of all sorts of materials, chairs of all sizes, chairs including contoured backrests, and chairs with roller wheels, etc. are all within the claim so long as they possess the recited flat surface and four legs.

Id. (citations omitted).

Consider the facts of *Amgen, Inc. v. Hoechst Marion Roussel, Inc.*[65] Amgen's claims were drawn to the protein erythropoietein (EPO). EPO occurs naturally in humans and controls the formation of red blood cells in bone marrow.[66] Amgen isolated the gene that produces EPO and used traditional recombinant DNA technology to generate large amounts of EPO, which is useful in treating anemia.[67] Based on its disclosure of this technique, Amgen's claims were construed to encompass "non-naturally occurring EPO."[68] If we treat "non-naturally occurring EPO" as a species within the genus of all "EPO" or even "all proteins," it is tempting to view the claim to cover just one embodiment: the composition of matter consisting of the protein EPO.[69] Thus, teaching the PHOSITA to make EPO—the claim's single embodiment—would be sufficient to enable the entire claim. Consequently, though the defendant used a different method to produce EPO, this did not demonstrate that Amgen failed to enable a claimed embodiment; the defendant merely used an alternative mode to reach the enabled embodiment—EPO.

Yet, not all EPO is the same. Amgen's technique for producing EPO used Chinese hamster ovarian host cells. This technique resulted in EPO with "the same or similar amino acid sequences and biological properties" as EPO produced from human cells but "differ[ed] in its 'glycosylation,' i.e., [] the patterns of branched carbohydrate chains that attach to the protein."[70] Differences in protein glycosylation are not trivial.[71] Thus, Amgen's claim is more properly understood as a genus claim that encompasses a range of non-naturally occurring EPO. Judge Clevenger took this position in his dissent:

> It is black-letter law . . . that disclosure of one or two species may not enable a broad genus under these circumstances. . . . At the very least, . . . [this] raises questions of its enablement, and I

65. 314 F.3d 1313 (Fed. Cir. 2003).

66. *Id.* at 1319.

67. *Id.* at 1321.

68. *Id.* at 1322.

69. The Federal Circuit's analysis of the claims suggests that this was its view. *See id.* at 1329. ("By limiting its claims [to non-naturally occurring EPO], Amgen simply avoids claiming specific subject matter that would be unpatentable under § 101"). Section 101 has been interpreted to preclude the patentability of natural phenomena. *See* Parke-Davis & Co. v. H.K. Mulford & Co., 189 F. 95 (S.D.N.Y. 1911), *aff'd*, 196 F. 496 (2d Cir. 1912) (holding that an extracted, purified form of adrenaline was patentable as different from the non-patentable compound that existed in nature). Thus, the court suggests that but for Section 101, Amgen would be entitled to the protein EPO.

70. *Amgen, Inc.*, 314 F.3d at 1321–22.

71. *See* Kurt Drickamer & Maureen E. Taylor, *Evolving Views of Protein Glycosylation*, 23 TRENDS IN BIOCHEM. SCI. 321, 323 (1998) ("Studies of the effects of glycosylation on protein structure and function suggest that glycosylation can affect the behaviour of proteins.").

> cannot agree that the district court chose correctly by ignoring those questions altogether.[72]

The defendant used an "innovative" process to create its EPO from human cells[73] and thereby produced an embodiment that differed in glycosylation from that produced by Amgen. The majority, however, never considered whether Amgen's disclosure enabled the PHOSITA to produce the defendant's embodiment.[74] Similarly, the *Invitrogen* court never considered whether the patent enabled point-mutated RT (the defendant's embodiment).[75] The conflict between Judge Clevenger and the *Amgen* majority exemplifies the predicament of the single embodiment rule: it seemingly relies on the traditional notion that species claims cover merely one entity. Thus, Amgen was granted exclusive rights to all "subsequent synthetic EPO molecules without having to enable the subgenera of molecules made by different synthetic processes."[76]

3. The Blended Rule

In *Spectra-Physics, Inc. v. Coherent, Inc.*, the Federal Circuit's main concern was whether the patentee satisfied § 112's best mode requirement.[77] After affirming the district court's finding of invalidity for failure to disclose the best mode, the Federal Circuit considered lack of enablement as an alternative basis for invalidity.[78] In doing so, it set forth yet another test for enablement:

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72. *Amgen Inc.*, 314 F.3d at 1360 (Clevenger, J., dissenting) (citation omitted).

73. *See id.* at 1325 (explaining that the defendant's process uses homologous recombination to take "the ordinarily unexpressed endogenous (or 'native') EPO gene in human cells and transfects 'a viral promoter and certain other DNA' that does not encode EPO"). This technology did not exist at the time of filing.

74. Indeed it appears that Amgen could not have enabled the defendant's embodiment because it required use of a technology that was not in existence when Amgen filed its patent application. *See id.* at 1335 (describing defendant's endogenous activation technology as "later-developed").

75. Invitrogen Corp. v. Clonetech Labs, Inc., 429 F.3d 1052, 1070 (Fed. Cir. 2005).

76. Lefstin, *supra* note 63, at 1172.

77. Spectra-Physics, Inc. v. Coherent, Inc., 827 F.2d 1524, 1529 (Fed. Cir. 1987).

78. I agree with Bernard Chao's observation that the Federal Circuit's non-enablement basis for reversal is likely dicta:

> In *Spectra-Physics*, the Court upheld the district court's invalidity finding on the alternative ground of failing to disclose the best mode. Arguably, this makes the decision reversing the enablement finding dicta. However, the Court expressly discussed its decision on enablement as a holding.

Chao, *supra* note 18, at ¶ 27 n.39 (citations omitted). *See also* Pierre N. Leval, *Judging Under the Constitution: Dicta About Dicta*, 81 N.Y.U. L. REV. 1249, 1257 (2006) (noting that "dictum is not converted into holding by forceful utterance, or by preceding it with the words 'We hold that . . . .'").

> If an invention pertains to an art where the results are predictable, e.g., mechanical as opposed to chemical arts, a broad claim can be enabled by disclosure of a single embodiment, and is not invalid for lack of enablement simply because it reads on another embodiment of the invention which is *inadequately disclosed.*[79]

Unlike the full scope rule, this test does not require enablement of all operable embodiments in the predictable arts. It also differs from the single embodiment rule in two respects. First, it is limited to the predictable arts. Second, *Spectra-Physics* is permissive; it provides that a single embodiment *can* enable a broad claim, unlike *Engel*'s single embodiment rule under which a claim is *per se* enabled by one embodiment.

In a footnote, the *Spectra-Physics* court claims that this articulation is the logical implication of having a separate best mode requirement "which contemplates that the specification can enable one to make and use the invention and still not disclose a single preferred embodiment."[80] However, this "logical implication" appears to be based on a faulty assumption. The best mode requirement of § 112 requires a patent applicant to disclose what she believes is the best means of practicing her invention, that is, her preferred embodiment.[81] Without this requirement, an inventor could still *enable* a PHOSITA to practice the entire scope of a claim, including the preferred embodiment, while retaining that embodiment as a trade secret.[82] Thus, while a specification may be enabling though it fails to disclose the best mode, it does not follow that the undisclosed preferred embodiment is not *enabled.* The *Spectra-Physics* decision errs by conflating disclosure (that is, revelation) of the best mode and enablement thereof, thereby creating a distinct—and relatively relaxed—articulation of the enablement standard.

II. CAN THE DIVERGENT ARTICULATIONS BE RECONCILED?

In the wake of *Liebel-Flarsheim* and its progeny, commentators labeled the full scope rule—and in particular, its application in the predictable arts—as a "new enablement standard" that "vitiates old

79. *Spectra-Physics*, 827 F.2d at 1533 (emphasis added) (citation omitted).

80. *Id.* at 1533 n.5.

81. *See* Bayer AG v. Schein Pharm., Inc., 301 F.3d 1306, 1314 (Fed. Cir. 2002).

82. *See In re* Gay, 309 F.2d 769, 772 (C.C.P.A. 1962). For example, consider a hypothetical inventor of the incandescent light bulb. She could satisfy the enablement requirement without revealing her preferred filament material, so long as the PHOSITA could discover how to make and use a bulb with that type of filament without undue experimentation.

doctrines"[83] and makes it "significantly easier for defendants to raise a lack of enablement defense."[84] This section defends the full scope rule as consistent with traditional enablement doctrine, including the so-called single embodiment rule, and suggests a framework with which the Federal Circuit can unify its seemingly inconsistent standards. Section A outlines a theory of "thing construction" that accounts for why courts find that some improvers literally infringe while others escape the reach of literal claim scope. Section B explains how this theory reconciles the full scope rule with the bulk of prior enablement doctrine and how the Federal Circuit can unify its seemingly divergent tests.

A. *Thing Construction and Its Effect on the Reach of Literal Claim Scope*

1. An Introduction to Thing Construction

A patentee's right to exclude is defined by what she claims and not by what she designed or disclosed.[85] This feature is known as the peripheral claiming approach because the words of a claim form a "conceptual fence"[86] that marks the outer boundaries of the patentee's rights.[87] Peripheral claims are often likened to the "metes and bounds" of a real property deed, setting out the perimeter of the patentee's rights.[88] But this analogy is misleading. The metes and bounds of a property deed specify the location of a spatial boundary and therefore demarcate a fixed set of propertized physical entities.[89] Conversely, peripheral patent claims identify conceptual subgenera or "thing-types"[90] instead of particular

83. Seymore, *supra* note 41, at 292.

84. Chao, *supra* note 18, at ¶ 33.

85. Or as Judge Rich, the author of the 1952 Patent Act, put it, "the name of the game is the claim." Giles S. Rich, *Extent of the Protection and Interpretation of Claims—American Perspectives*, 21 INT'L REV. INDUS. PROP. & COPYRIGHT L. 497, 499 (1990).

86. Dan L. Burk & Mark A. Lemley, *Fence Posts or Sign Posts? Rethinking Patent Claim Construction*, 157 U. PA. L. REV. 1743, 1744 (2009) (comparing peripheral claiming to central claiming) (internal quotations omitted).

87. Until 1870, the U.S. patent system used a central claiming approach. Under a central claiming regime, the patentee discloses the essential features of the invention that distinguish it from the prior art, and a court determines claim scope on a case-by-case basis by comparing the invention to the accused device. *Id.* at 1746.

88. *See, e.g.*, Motion Picture Patents Co. v. Universal Film Mfg. Co., 243 U.S. 502, 510 (1917); CAE Screenplates, Inc. v. Heinrich Fiedler GmbH & Co. KG, 224 F.3d 1308, 1319 (Fed. Cir. 2000).

89. *See* Kevin Emerson Collins, *The Reach of Literal Claim Scope into After-Arising Technology: On Thing Construction and the Meaning of Meaning*, 41 CONN. L. REV. 493, 554 n.233 (2006).

90. I borrow this terminology from Collins. *See id.*

physical entities.[91] Unlike physical entities, thing-types are merely abstractions, and any given thing-type contains an infinite range of physical embodiments. Thus, peripheral claim scope contains an array of thing-type subgenera that are encompassed by the claim.

Since these thing-types are merely conceptual entities, they do not have "fully formed, objective existences" before claim construction.[92] Courts determine the subgenera within a patent claim "when they categorize the infinite array of infringing [physical embodiments] into the discrete conceptual baskets, i.e. thing-types, that are tallied to determine the claim's thing-scope."[93] Collins terms this process "thing construction."[94] In other words, thing construction is "the identification of the subset of" properties belonging to the array of embodiments encompassed by the claim "that are relevant to the identities of the tallied thing-types."[95] Suppose, for example, that our hypothetical inventor claimed the incandescent light bulb. Assume that her specification disclosed embodiments of the incandescent bulb with an assortment of properties, including those with filaments made from carbonized paper and those made from wood carbon, and incandescent bulbs inside of a light fixture.[96] By engaging in thing construction, courts decide which properties of an allegedly infringing technology are relevant to defining thing-type subgenera. For instance, one court may treat all types of incandescent bulbs, regardless of their filament material, as a single genus. Such a thing construction overlooks the property of *having a specific filament material*; accordingly, incandescent bulbs with the property of

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91. But one might argue that the scope of central claims is more concerned with particular physical embodiments, namely, devices that are found to be infringing.

92. Collins, *supra* note 89, at 514.

93. *Id.* at 516.

94. *Id.*

95. *Id.* Collins explains that this type of categorization is distinct from that involved in claim construction and literal infringement:

> [Claim construction and literal infringement] start with a category defined by the claim language and query what belongs in the category by identifying the criteria needed for inclusion in the category (claim construction) and determining whether a given [embodiment] satisfies those criteria (literal infringement). The construction of things, however, runs the categorization process in reverse. Given a set of infringing technologies, what are the categories that one should create in order to house them? Although the claim language determines the extent of the group of infringing things that must be categorized, it does not provide the criteria that define the conceptual [subgenera] baskets into which those infringing things should be sorted.

Id. at 516 n.82.

96. This hypothetical is loosely based on the storied case of the *Incandescent Lamp Patent*, 159 U.S. 465 (1895), and is influenced by the work of Kevin Collins. *See generally* Collins, *supra* note 89.

having a carbonized paper filament are put in the same thing-type basket as those *having a wood carbon filament*. A second court may see things differently and consider the property of *having a specific filament material* in constructing thing-types. Accordingly, this court would treat incandescent bulbs with different filament materials as discrete thing-types.

Disparities in thing construction are not without consequence. In the case of allegedly infringing improvements, a court's approach to thing construction determines whether literal claim scope can stay fixed in some sense at the time of filing[97] even as it grows, in another sense, to encompass improvements. This relationship between thing construction and the reach of literal claim scope follows from the nature of improvements. Improvements are so named because the improver invents a new property or set of properties for a thing that has already been invented.[98] For example, an allegedly infringing light bulb may be an improvement because the bulb has the property of *having a newly-discovered carbonized bamboo filament* that allows it to burn for much longer. When improvements are framed in terms of newly-invented (or newly-discovered) properties for preexisting things, it becomes clear that thing construction can conceal the post-filing growth in literal scope that is required for a claim to encompass later-developed technology; a court need only engage in a manner of thing construction that overlooks the newly-invented property that marks the improvement as later-developed.[99]

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97. According to traditional fixation theory, the law of claim construction and § 112 disclosure doctrines require that claim scope remains fixed in some sense at the time of filing; in other words, it is impossible for literal claim scope to encompass technologies not known by the PHOSITA at the time application was filed because a patentee cannot enable technologies that are not in existence. *See* Christopher A. Cotropia, *"After-Arising" Technologies and Tailoring Patent Scope*, 61 N.Y.U. ANN. SURV. AM. L. 151, 167–68 (2005) (subscribing to fixation theory and concluding that literal claim scope cannot reach after-arising technology). In contrast, growth theory posits that the patentee need only enable the scope of the claim as it would be understood at the time of filing; afterwards, claim scope can grow to encompass later-developed technologies. *See* Mark A. Lemley, *The Changing Meaning of Patent Claim Terms*, 104 MICH. L. REV. 101, 109 (2005) (explaining how courts allow claims to capture later-developed technology by construing claims as of the time of infringement). The discussion in this section presumes that courts employ a variant of the fixation theory under which the meaning of claims is fixed in some sense at the time of filing yet grows, in another sense, to encompass improvements.

98. The improver could also discover a novel way of applying existing properties to a thing that another has previously invented.

99. *See* Collins, *supra* note 89, at 518. This elimination "renders the after-arising property irrelevant to the identity of thing-types and the distinctions between them. When the after-arising property is not a definitional property of the tallied thing-types, the allegedly infringing [improvement] can be thrown into a preexisting conceptual thing-type basket created for the constructively disclosed [i.e., enabled,] embodiments." *Id.*

The two courts from the incandescent light bulb hypothetical demonstrate this phenomenon. The first court ignored differences in filament material and grouped both bulbs with carbonized paper filaments and those with wood carbon filaments into the same thing-type subgenus. The second court, however, treated bulbs with different filament material as distinct thing-types. If the allegedly infringing improvement is a light bulb *with a later-discovered carbonized bamboo filament*, then the manner of thing-construction determines whether the claim scope can remain fixed as of filing but still encompass the improvement. Since the first court overlooked differences in filament material, that property is irrelevant to the identity of any particular thing-type subgenus. Thus, the carbonized bamboo embodiment would be grouped into the same subgenus in which both the carbonized paper and the wood carbon embodiments were categorized. The later-developed technology is therefore treated as the same "type of thing" that was enabled by the specification. As a result, the first court should find that the bulb with the later-discovered filament is within the literal scope of the original claim and that the claim is enabled. In contrast, the second court should either find that the carbonized bamboo embodiment falls outside of the literal claim scope or that the claim is not enabled. The second court's thing construction included discrete thing-type subgenera for different types of filaments, such as a *carbonized-paper-filament* subgenus and a *wood-carbon-filament* subgenus. The bulb with a carbonized bamboo filament, however, is an embodiment of a distinct subgenus that could not have been enabled by the original specification.[100] Since the carbonized bamboo embodiment does not fall within a contemplated thing-type, the original claim is either invalid for lack of enablement or there is no literal infringement.

Thing construction is similarly determinative of whether the literal scope of the incandescent light bulb claim can reach an incandescent street lamp. Here, the relevant property is *being housed in a street lamp light fixture* instead of *having a newly-discovered carbonized bamboo filament*. The outcome depends on whether the court treats incandescent bulbs inside and outside of street lamp light fixtures as distinct when identifying the thing-type subgenera that it tallies to measure claim scope. As a general matter, the more subgenera the court identifies during thing construction—that is, the fewer properties it "overlooks"—the less likely it is that literal claim scope will reach later-developed technologies.

100. This assumes, of course, that the carbonized bamboo embodiment could not have been discovered without undue experimentation.

2. The Distinction Between Intrinsic and Extrinsic Properties

The Patent Act does not indicate how courts should construct *things*. Therefore, whether some properties, but not others, are overlooked is completely up to the judiciary. Though there are no strict rules, courts appear to adhere to at least some guiding principles. One such principle is the distinction between intrinsic and extrinsic properties of things.[101]

a. Introducing Intrinsic and Extrinsic Properties

Intrinsic properties are those that are "wound up with making the thing that it is."[102] That is, an intrinsic property is "a property that a thing has (or lacks) regardless of what may be going on outside of itself,"[103] i.e., "a property that the object has by virtue of itself, depending on no other thing."[104] Mass, size, shape, and internal structure are conventionally understood to be intrinsic properties.[105] Thus, that a particular light bulb is *round*, that it is *five inches tall*, and that it *has a tungsten filament* are intrinsic properties; these properties cannot be changed without changing the light bulb itself.

In contrast, extrinsic properties are those that are not tied up with the identity of a thing. Instead, they "are dependent upon the context of the [object] or its relationships to things other than" the object in question.[106] In other words, extrinsic properties of an object are those that are "not entirely about" that object and "depend, wholly or partly, on something else."[107] Thus, the property of *being housed in a street lamp light fixture* is an extrinsic property of a light bulb, because it is dependent on the spatial relationship between the bulb and a separate object, the lamp fixture.

Since improvements are essentially new properties for earlier inventions,[108] improvements can be lumped into two categories: (1) intrinsic-property improvements, which "result from the invention of a

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101. This subsection briefly introduces this distinction and explains how it appears to govern the reach of literal claim scope into some types of improvements but not others. For a more detailed analysis of this distinction and its effect on the reach of literal claim scope to later-developed technologies, see Collins, *supra* note 89, at 521.

102. *Id.*

103. Stephen Yablo, *Intrinsicness*, 26 PHIL. TOPICS 479 (1999).

104. Michael J. Dunn, *Relevant Predication 2: Intrinsic Properties and Internal Relations*, 60 PHIL. STUD. 177, 178 (1990).

105. *See* Brian Weatherson, *Intrinsic vs. Extrinsic Properties*, See Brian Weatherson, *Intrinsic vs. Extrinsic Properties* STANFORD ENCYCLOPEDIA OF PHILOSOPHY, Jan 5, 2002, http://plato.stanford.edu/entries/intrinsic-extrinsic/ (mass and shape); David Lewis, *Extrinsic Properties*, 44 PHIL. STUD. 197 (1983) (internal structure).

106. Collins, *supra* note 89, at 522.

107. Lewis, *supra* note 105, at 197.

108. *See supra* note 98 and accompanying text ("[An] improver invents a new property or set of properties for a thing that has already been invented.").

new intrinsic property" for a previously patented invention; and (2) extrinsic-property improvements—those that result from the invention of a new extrinsic property for a previously patented invention.[109] The allegedly infringing incandescent light bulb *having a newly-discovered carbonized bamboo filament* can be seen as an intrinsic-property improvement because it represents a change in the internal structure of the original incandescent bulb by replacing the filament with a different material. On the other hand, the incandescent street lamp is an extrinsic-property improvement because the property of *being housed in a street lamp fixture* does nothing to change the previously invented light bulb itself.

b. How Does the Distinction Affect the Reach of Literal Claim Scope into Improvements?

Courts appear to routinely allow literal claim scope to reach extrinsic-property improvements. Consider the three classic forms of extrinsic-property improvements: (1) claims to combinations; (2) claims to new methods of making a previously claimed invention; and (3) claims to new uses of already claimed inventions. Prior to the advent of the full scope rule, courts routinely allowed literal claim scope to reach these types of improvements. That combinations infringe is inherent in the black letter law of infringement.[110] Moreover, courts are not concerned with whether the patentee enabled every method of making or using an invention. Indeed, this is the approach endorsed by the so-called "single embodiment" rule under which the enablement requirement is met "if the description enables any *mode* of making and using the claimed invention."[111] This rule contemplates that when an allegedly infringing improver makes something with the same intrinsic properties as that which was enabled by the patentee, new extrinsic properties—such as *being made by a later-developed process*—are irrelevant.

Take, for example, the facts of *Invitrogen*.[112] There, defendant Clonetech argued that because Invitrogen's disclosure only enabled the PHOSITA to make the claimed RT using deletion mutation, RT made by the later-developed point mutation technique was not enabled. Clonetech

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109. I borrow this terminology from Collins, *supra* note 89, at 527.

110. *See* A.B. Dick Co. v. Burroughs Corp., 713 F.2d 700, 703 (Fed. Cir. 1983) ("It is fundamental that one cannot avoid infringement merely by adding elements if each element recited in the claims is found in the accused device. For example, a pencil structurally infringing a patent claim would not become noninfringing when incorporated into a complex machine that limits or controls what the pencil can write.") (citations omitted).

111. Engel Indus., Inc. v. Lockformer Co., 946 F.2d 1528, 1533 (Fed. Cir. 1991) (emphasis added).

112. *See supra* Part I.C.2.

did not contend that its point-mutated RT embodiment was somehow intrinsically different than Invitrogen's RT; the defendant merely claimed to produce an extrinsic-property improvement. Reciting the "single embodiment" rule, the court held that Invitrogen's claim was enabled because disclosure of just one means for producing RT was sufficient. Thus, the court overlooked the property that made Clonetech's RT an "improvement"— *having been made with the later-developed point mutation technique*—and thereby allowed the claim's literal scope to reach Clonetech's embodiment.

The rationale behind decisions like *Invitrogen* is intuitive. Why should we allow those who make products which are intrinsically identical to a claimed invention escape infringement by merely placing that invention in a different context (in the case of combinations) or by using a different method to produce that invention? If this were allowed, the discovery of new combinations or ways of producing (or using) inventions would often render claims worthless. Discoveries of new methods with widespread application, such as point mutation, would effectively terminate all claims drawn to inventions that were previously made using a comparatively traditional method, such as deletion mutation.

B. *Reconciling the Full Scope Rule with Preexisting Doctrine*

As we have seen, labeling the language from *Engel*[113] a "single embodiment" rule is rather misdescriptive. Contrary to commentators' assertions,[114] the *Engel* rule never meant that enablement of a single *embodiment* is sufficient to enable a broader claim. It merely meant that enabling one *mode*, *method*, or *means* of producing and using the scope of the invention is sufficient; in other words, it is irrelevant whether the specification enables the PHOSITA to practice alternate methods of making or using the invention so long as the alternate method produces an object that is intrinsically the same as a well-enabled embodiment. This issue was highlighted in the cases discussed earlier, where each of the so-called "single embodiment" decisions rejected a defendant's argument that the patentee needed to enable an alternate *method* of producing a claimed entity.[115] Yet in none of these decisions did the court

113. *Engel*, 946 F.2d at 1533 ("The enablement requirement is met if the description enables *any* mode of making and using the claimed invention.") (emphasis added).

114. *See, e.g.*, Chao, *supra* note 18, at ¶ 50 (concluding that *Engel* held that "enabling any embodiment satisfies the enablement requirement regardless of the breadth of the claims"); Seymore, *supra* note 41, at 284.

115. *See supra* Part I.C.2. This claim ignores the failure of the *CellPro* court to consider CellPro's first contention that a subgenus of antibodies—which was intrinsically distinct from the well-enabled preferred antibody—was not enabled. *See supra* note 53 and accompanying text.

hold that enabling just one *embodiment* is sufficient. The *Engel* rule merely requires that courts overlook the extrinsic properties of *being made by an alternate process*[116] and *being used for an alternate purpose* during thing construction.

How then does the *Engel* rule differ from the full scope rule? That depends on what the Federal Circuit means by "full scope." The court has not expressly defined "full scope." When it introduced the rule in *AK Steel*, it mentioned only that Section 112 requires "reasonable enablement,"[117] and that failure to enable "a significant portion of the subject matter encompassed" by the claim renders the claim invalid.[118] Despite commentators' claims to the contrary,[119] the Federal Circuit's full scope decisions do not vitiate the *Engel* rule. In fact, none of these decisions even considered whether a claim was invalid for failure to disclose an alternate method of making or using the claimed invention.[120]

In contrast, each of the full scope decisions invalidated claims for failure to enable claimed embodiments with *intrinsic* properties that differed from those of well-enabled embodiments, much like carbonized bamboo filament embodiment in the light bulb hypothetical. For example, in *Liebel-Flarsheim*, Liebel's claims were drawn to a fluid injector system with a replaceable syringe capable of withstanding high pressure. The specification disclosed an injector with a pressure jacket. At Liebel's behest, however, the claims were construed to include both jacketed and jacketless injectors despite the fact that the inventor tried and failed to produce a jacketless system. The defendant, Medrad, improved upon the patentee's design by creating an injector system that worked without a pressure jacket. Like the carbonized bamboo filament embodiment, Medrad's embodiment was an intrinsic-property improvement; it differed from Liebel's product because it possessed the intrinsic property of *having no pressure jacket*. Liebel's claim was invalidated for failure to enable jacketless embodiments. Because the allegedly infringing device

116. This analysis, of course, does not apply to method claims. Where the invention is itself a process, that process is an intrinsic property of the invention. Consequently, alternate processes would constitute intrinsic-property improvements and would therefore exceed the scope of the claimed invention.

117. AK Steel Corp. v. Sollac, 344 F.3d 1234, 1244 (Fed. Cir. 2003).

118. *Id.* at 1245.

119. *See, e.g.*, Seymore, *supra* note 41, at 292 (calling the full scope rule a "new enablement standard" that "vitiates old doctrines").

120. In *AK Steel*, the claim was invalidated for lack of enablement because the specification "expressly [taught] against" a claimed embodiment. 344 F.3d at 1244. In *Sitrick*, the claims were drawn to integration of a user-added audio and video signals to a preexisting video game or movie. The claims were invalidated because the specification did not enable the PHOSITA to practice the invention with movies. Sitrick v. Dreamworks, L.L.C., 516 F.3d 993, 1000 (Fed. Cir. 2008). For a discussion of the Federal Circuit's reasoning in *Liebel-Flarscheim*, see *supra* Part I.C.1.

was an intrinsic-property improvement, the *Engel* rule simply did not apply.

Although the full scope decisions did not analyze, and therefore could not have rejected, the *Engel* rule, one could still make the case that the rules are incompatible.[121] After all, requiring enablement of the *full scope* of claims implies that every conceivable embodiment must be enabled, including extrinsic-property improvements. Under such an interpretation, however, literal claim scope could not reach either the incandescent street lamp improvement or Clonetech's point-mutated RT; for the reasons described above, the invention of new combinations or ways of producing or using inventions would therefore render many claims worthless.[122] More importantly, this interpretation would run afoul of well-established principles of literal infringement that treat combination-improvements as infringements.[123] It is inconceivable that the Federal Circuit would have intended such an absurd result.

Therefore, the full scope rule is best understood as requiring enablement of the full scope of a claim subject to the *Engel* rule. This understanding of the full scope rule and the inaptly named "single embodiment" rule resolves their apparent conflict and is consistent with longstanding rules of enablement and literal infringement.[124]

III. THE PROPOSED FRAMEWORK

As we saw in Part I, the advent of the full scope rule has lead commentators to identify as many as three separate rules for enablement. These commentators characterize the full scope rule as "a fundamentally different approach"[125] from that of *Engel* and recommend a

121. The *Automotive Technologies* court did reject ATI's argument that adequate disclosure of a single embodiment, i.e., mechanical side impact sensors, was sufficient to enable ATI's claims encompassing electronic sensors. *See* Auto. Technologies Int'l, Inc. v. BMW of N. Am., Inc., 501 F.3d 1274, 1285 (Fed. Cir. 2007). This was not, however, a rejection of the *Engel* rule, which applies to extrinsic properties. Rather, ATI sought to improperly extend the *Engel* rule to an intrinsic property: the structure of the sensor.

122. *See supra* Part II.A.2. *See* Lefstin, *supra* note 63 at 1173.

123. *See supra* note 110 and accompanying text.

124. Admittedly, this approach does not reconcile the *Spectra-Physics* rule, which states that a claim "is not invalid for lack of enablement simply because it reads on another embodiment of the invention which is inadequately disclosed." Spectra-Physics, Inc., v. Coherent, Inc., 827 F.2d 1524, 1533 (Fed. Cir. 1987). The *Spectra-Physics* rule, however, may have resulted from the court's conflation of the best mode and enablement requirements. *See supra* Part I.C.3.

125. Chao, *supra* note 18, at ¶ 49. *See* Seymore, *supra* note 41, at 280–84 (contrasting the full scope and single embodiment rules).

retreat[126] from the new rule. Part II concluded that critics of the full scope rule misinterpret the *Engel* rule. Properly understood, the *Engel* rule is compatible with the full scope rule, and together, the rules are consistent with well-established principles of enablement and literal infringement.

In light of this new understanding of the *Engel* and full scope rules, this Part contains four related proposals. First, the Federal Circuit should resolve the apparent conflict between its enablement tests by unifying the full scope and *Engel* rules. In doing so, it should clear up any ambiguities created by its full scope decisions. Second, the court should reemphasize the role of the PHOSITA and contemplate mandating consideration of the *Wands* factors. Third, the court should revive its practice of construing claims to preserve their validity. Finally, the Federal Circuit should provide guidance on whether literal claim scope can reach intrinsic-property improvements, and if so, in what cases.

A. *Resolve the Apparent Conflict Between the Enablement Tests and Clarify Any Ambiguities About the Full Scope Rule*

As a first step, the Federal Circuit should dispel any notion that there exists a "single embodiment" test. It should explicitly reject the misinterpretation of *Engel* that maintains "enabling any embodiment satisfies the enablement requirement regardless of the breadth of the claims."[127] Next, the court should explain the true meaning of the *Engel* rule: a patentee need not enable alternate means for producing or using the claimed invention. To make this point clear, it should also explain the work done by the *Engel* rule, namely, that it prevents those who make products intrinsically identical to those enabled by the specification from escaping infringement merely by using a different method to produce the claimed invention.[128] Finally, the Federal Circuit should unify the full scope and *Engel* rules by articulating the following joint rule: *the enablement requirement is met if the specification teaches the PHOSITA how to make and use the full scope of the claimed invention without undue experimentation, except that alternate methods of making or using the claimed invention need not be enabled.*[129]

In addition, the Federal Circuit should clarify any uncertainties created by its recent full scope decisions. In particular, it should reconsider

126. *See* Chao, *supra* note 18, at ¶ 3 (recommending that the Federal Circuit "take a step back from the full scope rule and return to the principles set forth in its earlier decisions").

127. *Id.* at ¶ 50.

128. *See supra* Part I.C.2.

129. The court could be even more explicit by explaining that the *Engel* rule applies only in cases where the alternate method produces entities that have the same intrinsic properties as that which was enabled by the patentee. *See supra* note 116 and accompanying text.

its application of the "novel aspect" requirement in *Automotive Technologies International, Inc. v. BMW of North America, Inc.*[130] In *Automotive Technologies*, the claimed invention was an automotive side impact velocity-type sensor used to trigger an airbag. At the behest of the patentee (ATI) the district court construed its claims to include both mechanical and electronic side impact sensors.[131] On summary judgment, however, the trial court held that ATI's patent was invalid for lack of enablement because it failed to provide sufficient details to teach a skilled artisan how to make and use an electronic sensor.[132] On appeal, ATI argued that despite its limited disclosure, "the knowledge of one skilled in the art was sufficient to supply the missing information." The Federal Circuit disagreed, holding that the specification, and not the PHOSITA's knowledge of art, must supply the "novel aspects" of the invention.[133]

It makes sense to require that the specification provide the novel aspects of an invention; after all, if the purported "novel aspects" of the invention existed in the prior art, they would be conventional—not novel. The Federal Circuit, however, mistakenly narrowed its inquiry to whether the portion of the specification dedicated to describing the electronic embodiment provided the novel aspects, as if it were isolated from the rest of the specification. In its analysis, the court acknowledged that the portion of the specification that disclosed the mechanical embodiment provided the novel aspect of the invention, namely, the use of "inertial or acceleration sensors to sense side impacts."[134] Yet the court strangely refused to consider the proper inquiry: whether the PHOSITA, equipped with the copious description of the mechanical embodiment—which disclosed the novel aspects—and the prior art, could adapt an electronic embodiment without undue experimentation. Enablement assesses whether the entire specification teaches the PHOSITA how to make and use the claimed invention without undue experimentation, not whether the portion of the specification dedicated to a particular embodiment, in isolation, enables that embodiment.[135]

130. 501 F.3d 1274, 1283 (Fed. Cir. 2007).

131. *Id.* at 1278.

132. *Id.* at 1280.

133. *Id.* at 1283.

134. *Id.*

135. Had the court engaged in the proper inquiry, it most likely would have ruled in ATI's favor. Recall that ATI appealed a district court's grant of summary judgment of non-enablement; thus, ATI merely needed to raise a genuine issue of material fact to overcome that ruling. The testimony of ATI's expert seemingly raised numerous genuine and material issues of fact regarding whether the PHOSITA could adapt an electronic sensor without undue experimentation. The expert claimed that: (1) the PHOSITA would know how to adapt then-existing technology to create an electronic side impact sensor; (2) electronic sensors were commercially available before the filing date; (3) based on engineering texts in 1989, one would have known how to select a commercial accelerometer, how to use analog circuits, and

By unduly restricting its novel aspect inquiry to the portion of the specification that described the embodiment in question, the *Automotive Technologies* decision effectively strengthened the enablement requirement. This strengthening, however, is not justified because the PHOSITA has the entire specification at her disposal. Therefore, the Federal Circuit should overrule this overly restrictive approach to the novel aspect inquiry.

B. *Reemphasize the Role of the PHOSITA and Consider Mandating the* Wands *Factors*

The Federal Circuit should also harness the patent bar's renewed focus on the enablement doctrine by reemphasizing the central role of the PHOSITA in enablement. The enablement inquiry often turns on whether the PHOSITA's knowledge of the art and routine experimentation can "fill in the gaps" and allow him to practice a claimed embodiment that was not disclosed.[136] Thus assessments of the PHOSITA's knowledge, his level of skill, and the point at which he considers experimentation to be undue can be dispositive of whether a claim is enabled. Consequently, to improve the chances that enablement achieves its policy objectives, courts should conduct a thorough factual inquiry to determine the skills and/or qualifications of the person of ordinary skill in the (narrow) field to which the particular invention pertains.

To this end, the Federal Circuit should recalibrate its view of the PHOSITA. Commentators have indicated that the Federal Circuit has a flawed conception of both the skill of the PHOSITA and the predictability of the art; it tends to underestimate the difficulty of writing software[137] but thinks that all of biotechnology is "incredibly unpredictable."[138] The problem stems from hindsight bias and reliance on industry-specific precedent rather than the particulars of each case,

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how to program and interface a microprocessor to process the signal using the existing prior art. *Id.* at 1284. Each of these statements appears to create a genuine and material issue of fact.

136. *See* Liebel-Flarsheim Co. v. Medrad, Inc., 481 F.3d 1371, 1380 (Fed. Cir. 2007) ("[T]he specification need not necessarily describe how to make and use every embodiment of the invention because the artisan's knowledge of the prior art and routine experimentation can often fill in the gaps."). For instance, would the PHOSITA's knowledge of how to adapt then-existing technology to create an electronic side impact sensor allow him to practice the electronic embodiment with only routine experimentation?

137. *See* Burk & Lemley, *supra* note 20, at 1199–1200.

138. *Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy: Hearings Before the Fed. Trade Comm'n on Economic and Other Perspectives on Patent Standards and Procedures* 106 (Apr. 10, 2002) [hereinafter *Hearings Before the FTC on Patent Standards*] (statement of Arti K. Rai, Professor of Law).

which leads to dated views of the PHOSITA's level of skill.[139] As others have noted, "hindsight bias risks infecting the PHOSITA analysis" and will "normally lead factfinders to overestimate the level of skill in the art," especially in technologies easily understood by the factfinder.[140] But in other cases, hindsight bias could have the reverse effect, "notably where certain things known or believed at one time to be feasible turn out later to be more difficult than anticipated."[141] Thus, to avoid contaminating the enablement test, courts should delve into a fact-intensive inquiry to determine the appropriate PHOSITA in each case.[142] Similarly, courts should make case-by-case determinations of the predictability of the narrow field in question.[143] Indeed, the same could be said for all factual questions relevant to enablement, for instance, what separates routine testing from undue experimentation? Because these factual inquiries are important for enablement, and hence, claim scope, mandating bona fide consideration of each *Wands* factor should promote a better balance between incentivizing first-generation inventions and improvements.[144]

C. *Revive the Maxim that Claims Should Be Construed to Preserve Validity*

Third, the Federal Circuit should return to its practice of construing claims to preserve their validity.[145] Invalidating a patent for lack of en-

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139. *See* Burk & Lemley, *supra* note 20, at 1201.

140. *Id.* at 1199.

141. *Id.*

142. *See id.* at 1202 (calling on courts to indentify the PHOSITA "anew in each case" and "spend more time and effort fleshing out the PHOSITA").

143. *Cf. Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy: Hearings Before the Fed. Trade Comm'n on Patent Law Analysis in Federal Circuit Jurisprudence* 198–99 (July 10, 2002) (statement of Dan L. Burk, Professor, University of Minnesota Law School) (explaining that courts have not accounted for the growing predictability of some biotech techniques); *id.* at 192–93 (statement of Stephen G. Kunin, Deputy Comm'r for Patent Examination Policy, U.S. Patent and Trademark Office) (suggesting that the increasing complexity of software inventions of software inventions may have reduced predictability).

144. *Hearings Before the FTC on Patent Standards*, *supra* note 138, at 118–19 (statement of Mark D. Janis, Professor of Law) (claiming that the enablement standard for software could be made "much more rigorous with good effect"); Burk & Lemley, *supra* note 20, at 1196 (suggesting that innovation in the software industry may benefit from a heightened enablement standard that would lead to narrower patents). To the extent this proposal focuses more on the PHOSITA, it allows for a more industry-specific enablement analysis, which could be used as a policy lever. *See* Burk & Lemley, *supra* note 16, at 1649 ("The PHOSITA is . . . central to calibrating the legal standard for patent disclosure.").

145. In *Klein v. Russell*, the Supreme Court introduced the canon of claim construction that, when possible, claims should be construed to preserve their validity. 86 U.S. 433, 466 (1873). This cannon of claim construction, however, has subsequently fallen out of favor. In *Phillips v. AWH Corp.*, the Federal Circuit, sitting en banc, acknowledged "that claims should

ablement may be a harsh result in some cases. Identifying all the embodiments that fall within claims can be a difficult—and at times, a seemingly Sisyphean—task. Indeed, prior to claim construction, it may be difficult for anybody to determine the precise scope of claims.[146] To soften the patentee's burden, defendants could be required to raise their enablement challenges during claim construction. With this information, courts could construe claims so that their full scope is enabled by narrowing them when appropriate.[147]

Recall the facts of *Liebel-Flarsheim Co. v. Medrad, Inc.*[148] Defendant Medrad challenged Liebel's proposed claim construction for failure to enable a jacketless injector system. This construction was necessary to capture Medrad's product, which worked without a pressure jacket. Despite its awareness of Medrad's enablement challenge, Liebel pursued the broader construction; thus, the court had little sympathy for Liebel when its claim was invalidated for lack of enablement. By requiring defendants to raise enablement challenges during claim construction, this proposal would put all plaintiffs on notice of potentially overbroad claims. Thus, the plaintiff would have the opportunity to narrow scope during claim construction or take its chances at showing that the challenged embodiment is indeed enabled.[149] This regime would therefore provide a means for courts to tailor a claim to its proper scope rather than having to invalidate the entire claim. Without this mechanism,

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be construed to preserve their validity," but reserved the principle for cases in which "the court concludes, after applying all the available tools of claim construction, that the claim is still ambiguous." 415 F.3d 1303, 1327 (Fed. Cir. 2005). Thus, the maxim essentially serves only as a tie-breaker.

146. *See* Burk & Lemley, *supra* note 86, at 1745 (describing the inherent indeterminacy of claim construction: "it may simply be impossible to cleanly map words to things") (citing BERTRAND RUSSELL, THE PHILOSOPHY OF LOGICAL ATOMISM 38 (David Pears ed., Open Court 1985) ("Everything is vague to a degree you do not realize till you have tried to make it precise.")).

147. Dan Burk and Mark Lemley appear to support this idea, albeit, not in this particular form. *See* Burk & Lemley, *supra* note 86, at 1797 (suggesting that "[c]ourts should be willing in appropriate cases to disregard claim language that doesn't seem to accurately capture what the patentee invented, rather than being prisoners to that language even when it subverts the intent of the patent."). Of course, there must be some limit to this practice. To borrow a rule from the doctrine of equivalents, a claim should not be construed in a manner that vitiates its plain meaning. Suppose a claim read:

> Composition X produced either by method 1 or 2.

That claim could not subsequently be construed to mean "Composition X produced only by method 1."

148. 481 F.3d 1373, 1380 (Fed. Cir. 2007). *See supra* Part I.C.1 (discussing the pertinent facts of the case).

149. Even if the patentee chooses to gamble, the odds are—in a sense—in her favor. Because all patents are afforded a statutory presumption of validity, the defendant bears the burden of proving invalidity by clear and convincing evidence.

courts may well be reluctant to faithfully apply the enablement standard because of the instinctive injustice of leaving the patentee empty-handed. Admittedly, a strictly applied enablement test would weaken ex ante incentives to the extent that it rendered more claims invalid; however, the opportunity to narrow claims while preserving at least part of their scope should reduce this effect. The harm to incentives for first-developers seems to be overshadowed by the benefit of increasing incentives for follow on innovation.[150]

In addition, the proposed regime would largely resolve the concern that the full scope rule indiscriminately benefits defendants that do not practice the challenged embodiment.[151] Such a defendant would have little to gain because it would still infringe the more-narrowly-construed claim.[152] Finally, this regime is consistent with commentary about the inadequacies of Patent and Trademark Office ("PTO") review.[153] With their limited time and resources, examiners surely cannot consider whether the infinite embodiments encompassed by a claim are enabled.[154]

D. *Provide Guidance on Whether Literal Claim Scope Can Reach Intrinsic-Property Improvements*

As discussed above in the examination of thing-construction, courts generally allow literal claim scope to reach extrinsic-property improve-

150. *See supra* notes 6–13 and accompanying text (discussing the tradeoff between encouraging pioneering inventions and improvements). One may also argue that construing claims in a manner that radically alters their scope impairs the notice function of patents. The peripheral claiming regime already fails "catastrophically" in that function, however. *See* Burk & Lemley, *supra* note 86, at 1791.

151. Bernard Chao raises the concern that the full scope rule raises fairness concerns by allowing defendants that practice enabled embodiments to escape infringement when the claim also covers non-enabled embodiments. *See* Chao, *supra* note 18, at ¶¶ 73–75 (identifying the issue and contrasting it with a traditional claim construction dispute).

152. Though, the defendant may improve its bargaining power in settlement talks by threatening to argue for a narrower construction. Furthermore, if the plaintiff refused to cede the challenged claim scope—e.g., to preserve its ability to challenge others or the defendant in the future—the plaintiff risks having the claim invalidated; conversely, the defendant may seek a narrow construction so that it may freely make the non-enabled embodiment in the future. This latter result may be desirable, especially if the non-enabled embodiment has yet to be invented. Under such circumstances, competition and/or the prospect of a patent (assuming patentability) may encourage creation of the invention.

153. *See* John R. Thomas, *Collusion and Collective Action in the Patent System: A Proposal for Patent Bounties*, 2001 U. ILL. L. REV. 305, 316–22; Doug Lichtman & Mark A. Lemley, *Rethinking Patent Law's Presumption of Validity*, 60 STAN. L. REV. 45, 47 (2007).

154. A natural question may be: if it is so difficult to identify the embodiments that fall within a claim's scope, how can the PTO apply enablement doctrine? There is not a good answer. In addition to the financial and time constraints, PTO examination does not benefit from the adversarial nature of infringement suits. Without an allegedly infringing device to consider, an examiner must imagine all the potentially claimed embodiments in the abstract. In short, the PTO can probably only handle the easy cases, while the hard cases are left up to courts.

ments.[155] Do courts allow literal claim scope to reach intrinsic-property improvements too? If the answer is yes, then there is no limit on the reach of literal claim scope into after-arising technology (AAT). If it is no, then literal claim scope can only reach AAT in the cases described above.[156] As it turns out, the answer varies from case to case.[157]

Consider the case of *In re Hogan*.[158] The claims—drawn to solid polymers of propylene—were originally rejected for lack of enabling disclosure because, although they were "generic in nature, [the] applicants . . . only described a very limited species within the generic class."[159] To support this rejection, the examiner cited several non-enabled species of amorphous polymers that were developed after the filing date. The Court of Customs and Patent Appeals reversed, holding that the later-developed amorphous polymers could not be used to invalidate the claims.[160] The specification did not enable the PHOSITA to produce amorphous polymers; it only taught one how to make crystalline polymers. Though the claims were not limited to the disclosed crystalline polymers, the patentee's disclosure was deemed sufficient because crystalline polymers were the only type of polymer in existence as of filing. The court further suggested that literal claims to pioneering inventions should be able to reach into intrinsic-property after-arising technologies:

> To restrict appellants to the crystalline form disclosed, under such circumstances, would be a poor way to stimulate invention, and particularly to encourage its early disclosure. To demand such restriction is merely to state a policy against broad protection for pioneer[ing] inventions . . . .[161]

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155. *See supra* Part II.A.

156. *See supra* Part II.A.2.b (discussing circumstances under which literal claim scope reaches extrinsic-property after-arising technology, such as combinations with later-developed technologies and embodiments that are made using a later-developed method).

157. As Kevin Collins explains:

> [T]he cases in which courts confront allegedly infringing intrinsic–property AAT are a mixed bag. Adhering to the fixation theory, some courts hold that literal claim scope cannot encompass intrinsic–property AAT as a matter of law because the commensurability requirement of the disclosure doctrines fixes claim scope on the date of filing and the growth required for claim scope to encompass the AAT is incompatible with this fixation. Yet, not all courts insist that intrinsic–property AAT does not literally infringe. Many courts conclude that literal claim scope can encompass intrinsic–property AAT.

Collins, *supra* note 89, at 533.

158. 559 F.2d 595 (C.C.P.A. 1977).

159. *Id.* at 600.

160. *Id.* at 605.

161. *Id.* at 606.

In *Plant Genetic Systems v. DeKalb Genetics Corp.*, the Federal Circuit came to the opposite conclusion.[162] The patentee's claims were drawn towards genetically engineered plants that were resistant to certain herbicides. Such plants were desirable because they "[could] grow in the presence of the herbicide that kills other unwanted plants or weeds."[163] The central issue in the case was which types of plants were covered by the claims. Flowering plants can be broadly classified as either monocots or dicots. Because it was not possible as of the filing date to produce monocots that met the claim limitations, the district court construed the claims to be limited to dicots.[164] Thus, the district court held that DeKalb's transgenic corn products could not infringe the claims since corn is a monocot.[165] On appeal, Plant Genetic Systems (PGS) relied heavily on *Hogan* in arguing that its literal claims should reach DeKalb's later-developed transgenic corn. The Federal Circuit rejected this argument, explaining that *Hogan* "cannot be read to assist improper enforcement against later developers. *Hogan* simply held that one could not use a later-existing state of the art to invalidate a patent that was enabled for what it claimed at the time of filing."[166] In the eyes of the court, the reasoning in *Hogan* simply goes too far, and that decision's discussion about the reach of literal claims into AAT were nothing more than "extended dicta."[167] Consequently, the Federal Circuit rejected PGS's attempt to reach DeKalb's AAT and affirmed the district court's finding of noninfringement.[168]

Though it expressly rejected the dicta of *Hogan*, *Plant Genetics* did not mark the end of courts allowing literal claim scope to reach intrinsic-property AATs. In *SuperGuide Corp. v. DirecTV Enterprises, Inc.*, the Federal Circuit held that a claim to systems for receiving "regularly received televisions signals" filed in 1985, covered digital television signals that were "not then in use by the television industry . . . much less described and enabled" in the patent application.[169]

The conflict between the majority and dissent in *Amgen, Inc. v. Hoechst Marion Roussel, Inc.* highlights yet another situation in which literal claim scope expanded to include intrinsic-property AAT.[170] As previously mentioned, not all EPO is the same. The defendant's EPO, which

162. 315 F.3d 1335 (Fed. Cir. 2003).
163. *Id.* at 1337.
164. *Id.* at 1338. Therefore, it appears that the district court considered enablement, at least implicitly, in construing the claims.
165. *Id.* at 1345.
166. *Id.* at 1340.
167. *Id.* at 1341.
168. *Id.* at 1345–46.
169. 358 F.3d 870, 898 (Fed. Cir. 2004) (Michel, J., concurring).
170. 314 F.3d 1313 (Fed. Cir. 2003).

was made using a later-developed process, differed from Amgen's EPO in glycosylation—patterns of branched carbohydrate chains that attach to the protein.[171] The majority quickly classified the defendant's EPO as an extrinsic-property AAT with the property of *being made by an alternate process*.[172] Accordingly, the majority applied the *Engel* rule and thereby allowed Amgen's literal claim scope to reach the defendant's EPO. However, the defendant's EPO was also an intrinsic-property AAT with the property of *having distinct patterns of branched carbohydrate chains*. Recognizing this, Judge Clevenger dissented, claiming that the majority allowed the claim too broad a scope given Amgen's disclosure of only one species.[173]

What explains the disparity of outcomes in cases in which literal claim scope expands to reach intrinsic-property AAT? It could be that Federal Circuit panels simply cannot agree about whether such expansion should be allowed. A more charitable explanation, however, is that courts sometimes treat intrinsic-property AAT as extrinsic-property AAT for policy reasons.[174] For instance, the *Amgen, Inc.* majority may have ignored trivial differences in the structure of the parties' EPO because there was no evidence that differences in glycosylation affect the therapeutic efficacy of EPO. Such treatment was necessary to preserve the policy behind the *Engel* rule; otherwise, the defendant would have escaped liability by using an alternate method of production merely because that method resulted in a trivial difference in an intrinsic property.

The apparent absence of a guiding principle in these cases is disconcerting. Though having fewer bright line rules can allow for more policy-driven tailoring, district courts cannot pull policy levers of which they are not aware. In light of the absence of guiding principles, and the stifling effects of broad claim scope on the development of improvements, the Federal Circuit should create a presumption that literal claim scope cannot reach intrinsic-property AAT.[175] Thus, unless the presumption is overcome, courts would follow the *Plant Genetics* approach. To overcome the presumption, a patentee could show that the difference in intrinsic properties is so trivial in terms of the purpose of the claimed invention that the AAT is akin to an extrinsic-property AAT; alternatively, a patentee could demonstrate that the distinct intrinsic property is not central to the claimed invention.

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171. *See supra* notes 70-71 and accompanying text; *Amgen, Inc.*, 314 F.3d at 1321–22.

172. *See Amgen, Inc.*, 314 F.3d at 1335.

173. *Id.* at 1360 (Clevenger, J., dissenting).

174. *See* Collins, *supra* note 89, at 535–36 (discussing how "courts may use thing construction as a policy lever").

175. The Federal Circuit may want the presumption to arise only when the defendant objects to the plaintiff's attempt to expand literal claim scope to reach intrinsic-property AAT.

Moreover, the Federal Circuit may wish to create certain per se exceptions. For example, it may wish to establish a rule that always allows the literal claim scope of mechanical inventions to reach allegedly infringing devices made from later-developed materials. In the pharmaceutical context where prospect theory is more salient, patentees may be permitted to reach *any* type of AAT so long as the allegedly infringing AAT is bioequivalent.

CONCLUSION

The enablement requirement is central to striking the optimal balance between encouraging first-generation inventors and improvers. It is therefore essential that the Federal Circuit mend the doctrine's current disarray. Though critics cast the full scope rule as a "new enablement standard" that "vitiates old doctrines," it is actually entirely consistent with preexisting doctrine. Contrary to critics' claims, the *Engel* rule merely claims that the patentee need not disclose alternate means for making or using the claimed invention. Accordingly, the *Engel* rule works alongside the full scope rule, and together, the rules are consistent with longstanding principles of enablement and literal infringement. The Federal Circuit should therefore unify the full scope and *Engel* rules and resolve any remaining ambiguities about the full scope rule's application.

It is also imperative that the enablement requirement actually operates in furtherance of its policy objectives. To this end, the Federal Circuit should reemphasize the role of the PHOSITA and contemplate mandating consideration of all the *Wands* factors. Moreover, it should resurrect the moribund maxim that claims should be construed to preserve their validity. Finally, the Federal Circuit should implement a two-tiered approach to after-arising technology, allowing claims to reach extrinsic-property AAT while presuming that intrinsic-property AAT falls outside of literal claim scope.