THE LEVELS OF ABSTRACTION PROBLEM IN PATENT LAW

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The Levels of Abstraction Problem in Patent Law

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The concept of "invention" is fundamental to patent law. What the patentee creates as the invention, he receives as his monopoly reward. This quid pro quo suggests that patent scope is self-defining: the patentee receives whatever invention he created, and nothing else.

The quid pro quo framework breaks down, however, because "invention" means different things on the two sides of the equation. The invention that the patentee creates is an embodiment. The invention that defines monopoly scope, however, is an idea. Moreover, every patented embodiment contains many ideas, at different levels of abstraction. Courts must choose one idea to give legal protection, with important consequences. The higher the level of abstraction chosen, the more scope the patentee receives, with attendant incentive benefits and monopoly costs.

Courts that have treated idea and embodiment as a unitary invention have ignored the necessity of this choice, effectively exercising their discretion arbitrarily and silently. This Article argues instead for a legal realist approach that acknowledges discretion in determining patent scope, discards the conflicting yet absolutist rules governing this area, and determines scope based on balancing incentives and monopoly costs, with transparent analysis allowing better information to be collected and greater predictability in outcomes.

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INTRODUCTION

No concept is more important in patent law than that of the "invention." In theory, the "invention" is what entitles an inventor to a patent, and correspondingly defines the scope of his monopoly.[1] The problem is that the meaning of "invention" differs depending on context, referring either to the specific working embodiment that the inventor created, or to the broader idea that is the subject of the patent monopoly. The failure to distinguish between these two concepts of invention causes significant confusion.

In the first sense of the word, an "invention" refers to a tangible and working apparatus or process.[2] A person becomes entitled to a patent by creating a new and useful "process, machine, manufacture, or composition of matter."[3] In contrast to these tangible creations, a disembodied idea is not patentable subject-matter.[4] In this paradigm, Edison's invention was a single incandescent lamp using carbonized bamboo filament, and the Wright Brothers invented a single glider that could barely fly.

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[1] *Universal Oil Prods. Co. v. Globe Oil & Refining Co.*, 322 U.S. 471, 484 (1944) ("As a reward for inventions and to encourage their disclosure, the United States offers a seventeen-year monopoly to an inventor who refrains from keeping his invention a trade secret.").

[2] *In re Nuijten*, 500 F.3d 1346, 1356 (Fed. Cir. 2007) (patentable products must be tangible).

[3] 35 U.S.C. § 101 (2000).

[4] *Rubber-Tip Pencil Company v. Howard*, 87 U.S. (20 Wall.) 498, 507 (1874) ("An idea of itself is not patentable, but a new device by which it may be made practically useful is.").

In the other contexts of patent law, however, an "invention" refers to an *idea*, not the specific embodiment that the patentee creates.[5] This occurs primarily in the determination of patent scope and infringement of the patent right. It is well-settled that, in the infringement context, patents protect the "principle" of the invention, not the particular form in which the patentee has embodied it.[6] In this paradigm, Edison's invention was *the* incandescent lamp, including future variants such as modern tungsten filaments; and the Wright Brothers' invention was *the* airplane, including modern F-117 jets.

The difference between ideas and embodiments is important. An embodiment contains many ideas at multiple levels of abstraction; while an idea can also be embodied in various alternative forms.[7] Despite the conceptual difference, patent law holds that the "invention" (meaning the embodiment) that creates the patent entitlement is the same as the "invention" (meaning the idea) that defines patent scope for infringement.[8] This artificial conflation of idea and embodiment means that courts have tied themselves into knots trying to define a single idea as "the invention" when the described embodiment contains an infinite number of ideas.[9] To take a concrete example, suppose an inventor produced a method of curing AIDS using radiation therapy, specifically using X-radiation, and then built a radiation machine that implements the method. This is a working embodiment. The ideas that underlie this cure can be broken into

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[5] *Pfaff v. Wells Elecs., Inc.*, 525 U.S. 55, 60 (1998) ("The primary meaning of the word 'invention' in the Patent Act unquestionably refers to the inventor's conception rather than to a physical embodiment of that idea.").

[6] *See, e.g.*, *Continental Paper Bag Co. v. E. Paper Bag Co.*, 210 U.S. 405, 418-19 (1908) ("The principle of the invention is a unit, and invariable; the modes of its embodiment in the concrete invention may be numerous and in appearance very different from each other."); *Winans v. Denmead*, 56 U.S. (15 How.) 330, 343 (1853) ("it is the duty of courts and juries to look through the form for the substance of the invention -- for that which . . . the patent was designed to secure"); *cf. Mazer v. Stein*, 347 U.S. 201, 217 (1954) (noting that copyrights protect only expression while patents protect the idea itself).

[7] *See* Robin C. Feldman, *The Inventor's Contribution*, 2005 UCLA J.L. & Tech. 6, ¶ 60 (2005) ("A patent holder need only identify a single use and a single embodiment for the product to receive rights to a wide range of embodiments and all uses.").

[8] *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 736 (2002) ("What is claimed by the patent application must be the same as what is disclosed in the specification.").

[9] *See* Peter D. Rosenberg, *Patent Law Fundamentals* 39 (1975) ("A claim is an abstraction and generalization of an indefinitely large number of concrete, physical objects.").

many different levels of abstraction, each being progressively more specific and resulting in narrower patent scope:

> 1. The idea of curing AIDS, covering all cures that might ever be devised.
>
> 2. The idea of curing AIDS by using radiation therapy, covering all cures using any type of radiation but not other methods.
>
> 3. The idea of curing AIDS by using radiation therapy, specifically by using X radiation; thereby excluding methods not using X radiation.
>
> 4. The idea of curing AIDS using radiation therapy, specifically by using X radiation, and more specifically by using the exact make and model of the patentee's radiation machine.

As can be seen from this example, each idea at a different level of abstraction can be accurately described as the "invention." A patentee choosing to claim his invention as "the cure for AIDS" would not appear to be wrong. By the same token, an accused infringer arguing that the patentee invented only one specific machine to cure AIDS and using only X radiation would appear equally right. Courts left to choose have no principled basis to distinguish.

How this choice is exercised, however, has tremendous consequences for both the incentives of inventors and the rights of subsequent improvers and users. A patent covering the broad idea of curing AIDS would entitle the patentee to all cures for AIDS, even a later cure that used a pill instead of radiation. This would provide great incentive to obtain the patent, but creates monopoly scope disproportionate to the contribution—after all, the patentee did not devise a cure with a pill, and a later inventor who invents a cure with a pill would have his research hampered by such a broad patent, and some AIDS patients will be priced out of receiving the improved pill by the monopoly prices.[10] But that reasoning works just as well if the patentee receives only the narrower idea of using radiation, because a later innovator who finds a new cure with Gamma radiation instead of X radiation would infringe the patent, but again our patentee did not invent curing AIDS with Gamma radiation, and again granting the patent will deter research into new cures for AIDS using different types of radiation as

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[10] *See* Robert P. Merges & Richard R. Nelson, *Market Structure and Technical Advance: The Role of Patent Scope Decisions*, in ANTITRUST, INNOVATION AND COMPETITIVENESS 185, 198-99 (Thomas M. Jorde & David J. Teece eds., 1992) ("Wide patent scope that exceeds the enablement of the disclosure makes anyone who attempts to invent in that area beholden to the patent owner.").

well as price some patients out of receiving the improved cure. Indeed, this reasoning works all the way down the slippery slope, until the patent covers only the specific radiation machine down to the last nut and bolt and paint color, at which point the patent becomes essentially worthless because even a pure pirate who does no research can avoid infringement by changing the paint color.[11]

This task of defining patent scope—translating an embodiment into a protected idea—is a classic *levels of abstraction* problem.[12] Avoiding arbitrariness when choosing a level of abstraction to express some idea or principle is notoriously difficult in every area of law.[13] The problem is exacerbated in patent law, however, because courts have not even acknowledged the nature of the problem. Instead, courts routinely treat the idea and embodiment in a patent as the same thing, such that the correct level of abstraction to express the idea is made to seem self-evident.[14] This only makes the task of ascertaining patent scope more difficult, by obscuring the process by which *one* level of abstraction is chosen from many available. The net result is that courts perform this choice *implicitly* and on an *ad hoc* basis, with the Federal Circuit devoting a sizable portion of its docket to determining the scope of individual patents during so-called "claim construction" or

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[11] Martin J. Adelman *et al.*, *Cases and Materials on Patent Law* 459 (2d ed. 2003) ("If courts strictly limit the scope of patent protection to the specific examples disclosed in the specification, competitors could readily circumvent the patent through minor changes in design.").

[12] *See* Dan L. Burk & Mark A. Lemley, *Quantum Patent Mechanics*, 9 Lewis & Clark L. Rev. 29, 51 (2005) (arguing that there is no right level of abstraction in defining claims vis-à-vis accused products).

[13] *See generally* Laurence H. Tribe & Michael C. Dorf, *Levels of Generality in the Definition of Rights*, 57 U. Chi. L. Rev. 1057, 1065-71 (1990) (discussing the problem of abstraction).

[14] *See, e.g.*, *Netword, LLC v. Centraal Corp.*, 242 F.3d 1347, 1352 (Fed. Cir. 2001) ("The claims are directed to the invention that is described in the specification; they do not have meaning removed from the context from which they arose."); *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1564 (Fed. Cir. 1991) ("The invention is, for purposes of the 'written description' inquiry, whatever is now claimed.").

"*Markman*" proceedings.[15] The murky process and its arbitrary results means that patent rights are subject to tremendous uncertainty.[16]

Once the nature of the levels of abstraction problem is understood, many of the apparently irresolvable problems in modern patent law can be better understood. Claim construction, a perennial problem for the Federal Circuit, is not a search for textual meaning but rather a policy debate about proper levels of abstraction. Enablement doctrine, another contentious area, is not about whether the full scope of a monopoly can be constructed without undue experimentation, but rather about the proper level of reward to give for one working embodiment. Understanding where the real disagreement lies, and how the policy choice *is* currently resolved, provides a foundation for future scholarship on how the policy disagreement might be *best* resolved.

This Article details the policy choice that is inherent in determining patent scope. It provides a legal realist framework within which to analyze the proper balance between the incentive benefits of greater scope with the cost of monopoly for subsequent improvement and beneficial use. This provides a foundation where the issue can be more transparently analyzed by courts and other scholars. Part I describes the current rules regarding scope, and demonstrates that each doctrine of patent scope contains inherent contradictions that create indeterminacy. Part II explores how the indeterminacy problems can be understood as a fundamental policy debate about the proper level of abstraction at which to characterize an invention. Part III then provides a more pragmatic framework within which to consider the policy issues inherent in patent scope. A brief conclusion follows.

I. THE UNITARY INVENTION FRAMEWORK AND ITS PROBLEMS

A. Background: The Specification and the Claims

An United States Patent is a complex document, but its two most important components are the written description of the invention

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[15] *See Markman v. Westview Instruments, Inc.*, 517 U.S. 370 (1996) (holding patent scope defined by claims to be a legal question). *See also* Jeffrey A. Lefstin, *The Measure of the Doubt: Dissent, Indeterminacy, and Interpretation at the Federal Circuit*, 58 Hastings L.J. 1025, 1071 (2007) (finding that claim construction was addressed in 51% of Federal Circuit opinions relating to patents).

[16] *See, e.g.*, James Bessen & Michael J. Meurer, *Patent Failure: How Judges, Bureaucrats, and Lawyers Put Innovators at Risk* 46-72 (2007); Gretchen Ann Bender, *Uncertainty and Unpredictability in Patent Litigation: The Time Is Ripe for a Consistent Claim Construction Methodology*, 8 J. Intell. Prop. L. 175, 202-17 (2001).

(commonly called the "specification") and the claims.[17] Both the specification and the claims are drafted by the patentee.

The specification describes the invention created by the patentee so that others can make and use it.[18] This requires considerable detail, so that the invention can be built from the ground up. For example, a specification describing a table should describe its specific shape (is it square or round); material (wood or plastic); manner of manufacture (using nails or screws); and what it is used for (dining tables or reading desks). A useful way to think about the specification description is that it figuratively deposits a physical embodiment of the patentee's creation into the patent office—and thus into the public domain—using words. Indeed, where words fail, as they often do in biotechnology, a physical deposit may be used instead.[19]

In contrast, a claim describes only the key inventive features of the invention—those that form the essence of the patentee's idea.[20] For example, a claim to a table might read "an apparatus with a flat surface and four legs." The consequence of reciting only those features that really matter—and omitting those that do not—is that claim language is rather generalized compared to the specification's description. Whereas a specification description substitutes for just *one* physical table, or a very limited number of tables, a claim to "an apparatus with a flat surface and four legs" will accurately describe *many* tables, of all different sizes, colors, and materials.

The generality of the claim corresponds to the scope of the patent. With minor exceptions,[21] the rule in patent law is that anything that is literally described by a claim infringes, while that which is not described by the claim does not infringe.[22] One implication of this rule is that added elements do not defeat infringement, once the minimum

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[17] Strictly speaking, the specification includes both the written description *and* the claims. In common parlance, however, the specification is used to refer only to the written description component of a patent, and I will do so in this Article. *See* Craig Allen Nard, *The Law of Patents* 39 (2008).

[18] 35 U.S.C. § 112 (2006).

[19] *Enzo Biochem, Inc. v. Gen-Probe Inc.*, 323 F.3d 956, 965 (Fed. Cir. 2002); *In re Wands*, 858 F.2d 731, 735 (Fed. Cir. 1988).

[20] Robert C. Faber, *Faber on Mechanics of Patent Claim Drafting* § 10:1.1 (6th ed. 2008) ("The claims should cover the inventor's concept.").

[21] The primary exception is the doctrine of equivalents, which holds that an "insubstantial difference" between a feature of an accused product and the claim language does not defeat infringement. *See Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 29 (1997). This element-by-element comparison still requires the doctrine of equivalents to operate within the strictures of the claim language.

[22] *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 374 (1996).

feature set is met.[23] For example, a four-legged table with a set of drawers and made of futuristic material is still "an apparatus with a flat surface and four legs," and so it infringes. In this way, the scope of a patent is the *class* of embodiments described by the claim, while the specification describes only one particular embodiment within that class.

Procedurally, obtaining a patent requires the patentee to first create the specification embodiment,[24] and then to write claims for it.[25] There are essentially two limits on writing a claim. The first is that the claim cannot cover anything previously in the public domain, what patent lawyers call the "prior art."[26] This requirement of novelty and non-obviousness is important, but does not much affect patent scope, which is about defining the 'invention" and necessarily occurs after non-obviousness is found. Rather, patent scope is constrained primarily by the second requirement: the claim must cover the same invention as described in the specification.[27]

This second rule, that the claim must cover the same invention as described in the specification, is what I shall call the "unitary invention principle," and is extremely important.[28] It reflects the fundamental idea of *quid pro quo*: the patentee receives as a monopoly only those things that he first created, and nothing more.[29] It also underlies the practical operation of the patent system, where U.S. Patent and Trademark Office ("PTO") examiners, otherwise known as government bureaucrats, must make the decisions on what patent claims to allow or deny. It is extremely important that such decisions are purely *ministerial*—the PTO bureaucrats simply allow or reject claims to monopoly rewards based on fixed statutory criteria, and

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[23] *See* Robert P. Merges & John F. Duffy, *Patent Law and Policy: Cases and Materials* 28 (4th ed. 2007) (describing "open" claims).

[24] The patentee can create the embodiment actually or constructively. Constructive reduction to practice is achieved simply by describing the embodiment in detail in the specification. Actually building a physical model is not required. *Cooper v. Goldfarb*, 154 F.3d 1321, 1327 (Fed. Cir. 1998).

[25] *See* Merges & Duffy, *supra* at note 23, at 26 (noting that claims are "often modified extensively" after the patent application is filed).

[26] *Id.* at 27; *see* 35 U.S.C. §§ 102 & 103 (2006).

[27] *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 736 (2002) ("What is claimed by the patent application must be the same as what is disclosed in the specification.").

[28] Robert P. Merges & Richard Nelson, *On the Complex Economics of Claim Scope*, 90 Colum. L. Rev. 839, 844-45 (1990) ("This fundamental principle—that legal protection is premised on an adequate disclosure of the invention—is built deep into the history of patent law").

[29] *See Sitrick v. Dreamworks, LLC*, 516 F.3d 993, 999 (Fed. Cir. 2008).

judges reviewing the decisions do likewise.[30] It would be intolerable for research companies who invest millions of dollars toward new inventions (e.g. cures for AIDS) to have the scope of their patents—and thus the level of reward—become a matter of judicial or bureaucratic whim.[31] Rather, the scope of a patent and its reward should be calibrated by the patentee's contribution.[32] The PTO thus *must* issue deserving patents and *must* reject undeserving ones: it has no policy discretion in matters of patent scope.[33] Rather, a patentee "is *entitled* to claims as broad as the prior art and his disclosure will allow."[34]

In addition to governing the scope of allowable claims and removing bureaucratic discretion, the unitary invention principle also helps the judicial administration of the patent system. A predicate to determining infringement is understanding what the claim language means.[35] Assuming that the claims and the specification describe the same thing, just in different ways,[36] makes claim interpretation easier. The specification is always more detailed than the claim, and a drawing in the specification is worth a thousand words.[37] Everyone can see how a physical radiation machine works, whereas claim language on paper is never quite as good.[38] Looking to a concrete and detailed embodiment—that represents the same invention as the one claimed—can help greatly in clarifying claim language. The principle that the specification and the claims describe a unitary invention thus

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[30] *See Animal Legal Def. Fund v. Quigg*, 932 F.2d 920, 930 (Fed. Cir. 1991) (PTO lacks authority over substantive patent law).

[31] Giles S. Rich, *Principles of Patentability*, 28 Geo. Wash. L. Rev. 393, 402 (1960) ("That is one of the beauties of the patent system. The reward is measured automatically by the popularity of the contribution.").

[32] *Id.*

[33] 35 U.S.C. § 131 (2006) (stating that "if on such examination it appears that the applicant is entitled to a patent under the law, the Director *shall* issue a patent therefore" (emphasis added)).

[34] *Gentry Gallery v. Berkline Corp.*, 134 F.3d 1473, 1480 (Fed. Cir. 1998) (emphasis added and internal quotations omitted).

[35] *Cybor Corp. v. FAS Technologies, Inc.*, 138 F.3d 1448, 1454 (Fed. Cir. 1998) (*en banc*) ("An infringement analysis involves two steps. First, the court determines the scope and meaning of the patent claims asserted.").

[36] *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1561 (Fed. Cir. 1991) ("the two standards, while complementary, approach a similar problem from different directions" (quoting *Rengo Co. v. Molins Mach. Co.*, 657 F.2d 535, 551 (3d Cir. 1981)).

[37] *See id.* at 1566 (finding the claimed "invention *is* what the '081 drawings show" (emphasis in original)).

[38] Even if no physical embodiment is built, and the specification is also just a paper description, the specification description will always be considerably more detailed and concrete than the claim language.

underlies all of the doctrines of patent scope, both determining what degree of scope is requested (claim construction) and whether it should be permitted (enablement and written description). Vague claim language should be clarified by looking to the specification;[39] and the claimed monopoly should be allowed to cover only those things that the specification teaches.[40]

The problem is that the unitary invention principle is simply untrue. The specification and the claims do not describe the same thing in different ways. They describe entirely different concepts with only tenuous relation to each other. The specification describes a single embodiment. The claim describes an idea. The tenuous connection is that the specification embodiment contains the claimed idea. But the claimed idea may be reflected in countless other embodiments, and conversely every embodiment contains many other ideas. The forced meshing of idea and embodiment thus confuses rather than elucidates, creating problems in each of the scope doctrines, as the following sections discuss.

B. Claim Construction

In most patent cases, claim construction is the most important determinant of the outcome.[41] As mentioned earlier, claims (if they are valid) define the scope of the patent, by specifying the features that must be present in an infringing product.[42] A product that contains all the described features infringes; while a product that omits one or more required features does not infringe. The recited features are known as the "elements" or "limitations" of a claim.[43]

Claim construction is the process of taking the language of a claim and translating it concretely into a set of required features in the physical world,[44] which are then either present or absent in an accused

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[39] *Phillips v. AWH Corp.*, 415 F.3d 1303, 1315 (Fed. Cir. 2005) (*en banc*).

[40] *Sitrick v. Dreamworks, LLC*, 516 F.3d 993, 999 (Fed. Cir. 2008).

[41] David L. Schwartz, *Courting Specialization: An Empirical Study of Claim Construction Comparing Patent Litigation Before Federal District Courts and the International Trade Commission*, 50 Wm. & Mary L. Rev. 1699, 1708 (2009).

[42] A claim may also describe a process, with one or more required steps. 35 U.S.C. § 101 (defining patentable inventions to include processes). The infringement inquiry with process claims is not materially different.

[43] *See TIP Systems, LLC v. Phillips & Brooks/Gladwin, Inc.*, 529 F.3d 1364, 1379 (Fed. Cir. 2008) ("Under the 'all elements' rule, to find infringement, the accused device must contain 'each limitation of the claim, either literally or by an equivalent.'" (quoting *Freedman Seating Co. v. Am. Seating Co.*, 420 F.3d 1350, 1358 (Fed. Cir. 2005))).

[44] Burk & Lemley, *supra* at note 12, at 50.

product. It has special importance in patent law because, in most cases, there is no dispute about what features are in the accused product, since the accused product is often publicly sold and in any case can be brought into a courtroom for all to see.[45] The only dispute is over whether the undisputed features of the accused product are described by the language of a claim.[46] Once the claim has been construed, most cases either settle or are resolved on summary judgment.[47]

Under the formalist theory of patent scope, where scope is fixed by statute to match patentee contribution and neither courts nor the PTO exercise discretion, claim construction is a textual exercise.[48] Courts should interpret a claim according to its language, using standard tools of textual interpretation.[49] Such a textual exercise, of course, has no room for policy. It is not appropriate for a court to shape the scope of a claim according to its desires, using interpretation as a guise;[50] and, in particular, a court should never twist the words of a claim in order to include or exclude a particular product.[51] This formalistic framework is necessary, according to the Federal Circuit, because the alternative of allowing policy discretion to enter the claim construction inquiry "would make infringement a matter of judicial whim."[52]

In implementing the formalist framework, two doctrines are paramount. Unfortunately, they are also utterly irreconcilable with each other.

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[45] *See, e.g.*, *Gen. Mills v. Hunt-Wesson, Inc.*, 917 F. Supp. 663, 667 (D. Minn. 1996) (noting that "proper construction of a claim can make short work of the question of infringement" because features of accused product were undisputed).

[46] *See Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 989 (Fed. Cir. 1995) (*en banc*) (Mayer, J., concurring) ("to decide what the claims mean is nearly always to decide the case").

[47] Mark A. Lemley, *The Limits of Claim Differentiation*, 22 Berkeley Tech. L.J. 1389, 1390 (2007).

[48] *Scripps Clinic & Research Found. v. Genentech, Inc.*, 927 F.2d 1565, 1580 (Fed. Cir. 1991) ("the construction of claims is simply a way of elaborating the normally terse claim language: in order to understand and explain, but not to change, the scope of the claims").

[49] *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 388-89 (1996) (characterizing claim construction as another case involving "construction of written instruments").

[50] *Cimiotti Unhairing Co. v. Am. Fur Ref. Co.*, 198 U.S. 399, 410 (1905) (courts "may not add to or detract from the claim").

[51] *SRI Int'l v. Matsushita Elec. Corp. of Am.*, 775 F.2d 1107, 1118 (Fed. Cir. 1985) (*en banc*) (stating that claims are not to be construed in light of the accused device).

[52] *Id.*

The first fundamental doctrine of claim construction is that claims should always be interpreted "in the light of [their] specifications."[53] This follows from the unitary invention principle. Since the embodiment in the specification is the "invention" as much as the claim language, the two should be compared for context.[54] The specification is much more detailed, and often supplies details that abstract claims lack.

A good case demonstrating of how this first rule is applied is *Kinetic Concepts, Inc. v. Blue Sky Medical Group, Inc.*[55] In *Kinetic Concepts*, the patentee claimed a treatment for a "wound." The word "wound" is a pretty commonly understood and generic concept, which usually includes any injury to the body.[56] The specification of the patent, however, described only one type of wound: *skin* wounds.[57] The Federal Circuit held that the broad claim language was narrowed to the categories disclosed in the specification:

> All of the examples described in the specification involve skin wounds. . . . To construe "wound" to include fistulae and "pus pockets" would thus expand the scope of the claims far beyond anything described in the specification.[58]

In short, because the claim and the specification describe a single "invention," the specification clarifies that the generic word "wound" really translates to only one type of wound (skin wounds) in the real world.

The problem with such an approach to claim construction, however, is that reducing abstractness (*i.e.* generality) through reference to the specification embodiment has no limits.[59] Just as a "wound" can be limited to "skin wounds" because those were the only type of wounds in the specification embodiment, so too "skin wounds" might further be limited to, say, skin wounds *on the arm*, if that were the only type of skin wound described in the specification embodiment, and so on. The

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[53] *Schriber-Schroth Co. v. Cleveland Trust Co.*, 311 U.S. 211, 217 (1940).

[54] *See, e.g.*, *Netword, LLC v. Centraal Corp.*, 242 F.3d 1347, 1352 (Fed. Cir. 2001) ("The claims are directed to the invention that is described in the specification; they do not have meaning removed from the context from which they arose.").

[55] 554 F.3d 1010 (Fed. Cir. 2009).

[56] *Id.* at 1018 (quoting *Stedman's Medical Dictionary*).

[57] *Id.* at 1019.

[58] *Id.*

[59] *McCarty v. Lehigh Valley R.R. Co.*, 160 U.S. 110, 116 (1895) ("if we once begin to include elements not mentioned in the claim, in order to limit such claim . . . , we should never know where to stop").

end of this slippery slope would be a patent that covered only the precise embodiment described in the specification, and changing just the paint color or body part would avoid infringement. This would be bad for patent incentives because even a pure pirate would know how to change the paint color, or to take the *Kinetic Concepts* treatment method and use it to treat wounds on the leg.

For this reason, the second fundamental doctrine of claim construction is that a court must never "import[ ] limitations from the specification into the claim."[60] Instead, the claim language alone "measures the grant" of a patent.[61] Of course, to "import" limitations from the specification means narrowing a broadly worded claim by referencing the features of a specification embodiment. Thus, a generally worded claim to "wounds" is narrowed to "skin wounds,"[62] importing the requirement of skin. Such lowering of the level of generality in claims is precisely the purpose and effect of interpreting claims "in light of the specification."[63] These two fundamental doctrines of claim construction, therefore, directly contradict each other in purpose and effect, as many commentators have noted,[64] and as courts have partially acknowledged.[65]

The effect of contradictory doctrine is that claim construction outcomes are impossible to predict without litigation, and judicial disagreement frequently arises when such issues are litigated.[66]

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[60] *Phillips*, 415 F.3d at 1323;

[61] *Graver Tank & Mfg. Co. v. Linde*, 336 U.S. 271, 277 (1949).

[62] See text accompanying notes 55–59, *supra*.

[63] *Watts v. XL Sys., Inc.*, 232 F.3d 877, 882 (Fed. Cir. 2000) ("One purpose for examining the specification is to determine if the patentee has limited the scope of the claims.").

[64] *See, e.g.*, Merges & Duffy, *supra* at note 23, at 803; Robert Unikel & Douglas Eveleigh, *Protecting Inventors, Not Fortune Tellers: The Available Patent Protection for After-Developed Technologies*, 34 AIPLA Q.J. 81, 88 n.9 (2006) ("How one can read claims 'in light of the specification' but yet avoid importing limitations from the specification has never been adequately explained, perhaps because these ostensibly contradictory tenets of claim construction cannot be reconciled.").

[65] *See, e.g.*, *Comark Communications, Inc. v. Harris Corp.*, 156 F.3d 1182, 1186-87 (Fed. Cir. 1998) ("there is sometimes a fine line between reading a claim in light of the specification, and reading a limitation into the claim from the specification").

[66] Russell B. Hill & Frank P. Cote, *Ending the Federal Circuit Crapshoot: Emphasizing Plain Meaning in Claim Construction*, 42 IDEA 1, 2 (2002) (describing uncertainty); Kimberly A. Moore, Markman *Eight Years Later: Is Claim Construction More Predictable?*, 9 Lewis & Clark L. Rev. 231, 233, 239 (2005) (reporting a 34.5% reversal rate for claim construction). Another sign that claim construction is particularly unpredictable is that experienced

Courts sometimes grant the broad scope reflected by the plain language of a claim, and at other times limit the claim to a precise embodiment in the specification, and most often reach some middle position where the claim is not as abstract as the language reflects, but also encompasses more than the specification embodiment. This uncertainty harms every participant in the patent system because it increases risk, encourages litigation, and disrupts business planning.[67] The fact that real patent scope is determined *ex post* by judicial interpretation also frustrates PTO decision-making,[68] since the PTO cannot predict what eventual scope a court will give a claim, and thus may inadvertently issue undeserved patents or erroneously reject meritorious patents.[69]

Far from creating a determinate and predictable system that secures patentee rights free from the arbitrary whims of judges and PTO bureaucrats,[70] current claim construction doctrine—based on the formalistic unitary invention framework—creates precisely the indeterminate free-for-all that formalism seeks to avoid.

C. Enablement and Written Description

If claim construction were the only link between the specification and the claims, then the unpredictability problem could be mitigated. Patentees control claim drafting, and indeed have unlimited chances to correct vague claims after-the-fact.[71] An erroneous claim construction by one court (such as limiting claim scope to the specification embodiment) could subsequently be counteracted by returning to the

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district court judges appear to do no better in avoiding reversal. David L. Schwartz, *Practice Makes Perfect? An Empirical Study of Claim Construction Reversal Rates in Patent Cases*, 107 Mich. L. Rev. __ (forthcoming 2008) (manuscript at 36, available at http:// ssrn.com/abstract=1012949).

[67] *See, e.g.*, Bessen & Meurer, *supra* at note 16, at 130-44 (showing that patents are a net disincentive for innovation due to unpredictability and litigation costs); Jeffrey A. Lefstin, *Claim Construction, Appeal, and the Predictability of Interpretative Regimes*, 61 U. Miami L. Rev. 1033, 1041-42 (2007) ("predictability is paramount . . . when participants in the patent system decide whether to invest resources in developing inventions, whether to pursue patent protection, whether to embark upon potentially infringing business ventures, or whether to initiate infringement litigation").

[68] *See* Tun-Jen Chiang, *Fixing Patent Boundaries*, 108 Mich. L. Rev. (forthcoming 2010) (arguing that *ex post* determination allows patentees to game claim construction to their advantage).

[69] *SRAM Corp. v. AD-II Eng'g, Inc.*, 465 F.3d 1351, 1359 (Fed. Cir. 2006) (court may interpret claims more broadly than PTO).

[70] *See SRI Int'l*, 775 F.2d at 1118.

[71] Chiang, *supra* at note 68; Mark A. Lemley & Kimberly A. Moore, *Ending Abuse of Patent Continuations*, 84 B.U.L. Rev. 63, 64 (2004).

PTO and amending the claim language in a reissuance proceeding.[72] Patentees can often also preemptively resist the importing of limitations from the specification by very insistent language.[73] A good historical example of such preemptive resistance is the eighth claim of Samuel Morse's patent on the telegraph:

> Eighth, *I do not propose to limit myself to the specific machinery or parts of machinery described* in the foregoing specification and claims; the essence of my invention being the use of the motive power of the electric or galvanic current, which I call electromagnetism, however developed, for making or printing intelligible characters, signs or letters at any distances.[74]

As the Supreme Court noted when examining this claim, it is "impossible to misunderstand the extent of this claim," and no court could narrow the claim down to a specific machine embodiment without appearing flatly unreasonable.[75] Thus, instead of using claim construction to narrow the claim, the Court invalidated Morse's claim entirely.[76] Invalidity thus serves as a "hard" limit on broad claims when the "soft" limit of claim construction is circumvented.

The *Morse* Court did not give a clear doctrinal basis for invalidating the claim.[77] Modern patent law, however, would sustain the invalidation under the enablement doctrine.[78] The enablement doctrine requires a specification to teach an ordinary person of skill in

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[72] 35 U.S.C. § 251 (2006).

[73] *See* Friedemann Horn, "Preparing a Patent Specification for Filing with the U.S. Patent and Trademark Office," *JAT Bulletin* 178 (Jan. 2000), available online at http://old.jat.org/jtt/bulletin/0001/07.html (last visited July 2, 2009) ("For U.S. specifications, it is customary to end the [specification] with a disclaimer, in which the applicant states that the preceding examples are only examples, and that there are other ways to work the invention.").

[74] *O'Reilly v. Morse*, 56 U.S. (15 How.) 62, 86 (1853) (emphasis added).

[75] *Id.* at 112.

[76] *Id.*

[77] Commentators have noted the difficulty in categorizing *Morse*'s invalidation under modern criteria for rejecting claims. *See* Dana Remus Irwin, *Paradise Lost in the Patent Law? Changing Visions of Technology in the Subject-Matter Inquiry*, 60 Fla. L. Rev. 775, 792 & n.107; Vincent Chiappetta, *Defining the Proper Scope of Internet Patents: If We Don't Know Where We Want to Go, We're Unlikely to Get There*, 7 Mich. Telecomm. & Tech. L. Rev. 289, 317 n.147 (2002).

[78] *See* A. Samuel Oddi, *Regeneration in American Patent Law: Statutory Subject Matter*, 46 IDEA 491, 514 (2006) (arguing that, in modern theory, *Morse* would be better considered as an enablement issue).

the art "how to make and use the full scope of the claimed invention."[79] As the *Morse* Court noted, Morse's patent could not possibly have taught *every* mode of using electromagnetism to communicate characters at a distance, as he claimed to have invented:

> For aught that we now know, some future inventor, in the onward march of science, may discover a mode of writing or printing at a distance by means of the electric or galvanic current, without using any part of the process or combination set forth in the plaintiff's specification. His invention may be less complicated -- less liable to get out of order -- less expensive in construction, and in its operation. But yet if it is covered by this patent, the inventor could not use it, nor the public have the benefit of it, without the permission of this patentee. . . . In fine, [Morse] claims an exclusive right to use a manner and process which he has not described and indeed had not invented, and therefore could not describe when he obtained his patent.[80]

Viewed within the unitary invention framework, this application of the enablement requirement makes perfect sense. If Morse wanted to claim every device that would ever use electromagnetism to communicate characters at a distance, he must teach how to make and use everything he claims. Teaching just one telegraph machine does not permit Morse to claim every future machine that might ever be developed. Enablement is lacking when the specification teaches "only one or a few embodiments and do[es] not demonstrate with reasonable specificity how to make and use other potential embodiments across the full scope of the claim."[81] Of course, a specification does not need to *explicitly* teach every variation in material and color that a telegraph machine might have; rather, the reasonable skill of an ordinary artisan will allow such minor variations to be considered taught even if not explicitly mentioned.[82] Importantly, however, enablement considers the reasonable skill of an ordinary artisan only at the time of the patent filing, excluding all subsequent advances in technology.[83] The

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[79] *In re Wright*, 999 F.2d 1557, 1561 (Fed. Cir. 1993).

[80] *Morse*, 56 U.S. at 113.

[81] *PPG Indus., Inc. v. Guardian Indus. Corp.*, 75 F.3d 1558, 1564 (Fed. Cir. 1996).

[82] *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384 (Fed. Cir. 1986).

[83] *In re Hogan*, 559 F.2d 595, 604 (C.C.P.A. 1977),

question is what the patentee has contributed at the time of patent filing.[84]

The Supreme Court elaborated on the enablement requirement in the *Incandescent Lamp Patent Case*.[85] Two inventors, William Sawyer and Albon Man, had produced an incandescent lamp with a filament of carbonized paper.[86] The lamp did not work very well and was a commercial failure,[87] but nonetheless it worked. Like all patentees, Sawyer and Man were not content with exclusive rights covering only carbonized paper filaments, which would have been very narrow and easily avoided.[88] Instead, Sawyer and Man abstracted out their invention, stating that it covered an incandescent lamp using any "carbonized fibrous or textile material" as filament.[89]

The Supreme Court invalidated the patent. The problem was that Sawyer and Man "made a broad claim for every fibrous or textile material, when in fact an examination of over 6,000 vegetable growths showed that none of them possessed the peculiar qualities that fitted them" for the purpose of being used as filament.[90] Thus, a person taking Sawyer and Man's disclosure would not be able to make an incandescent lamp made of every fibrous or textile material without "painstaking" (*i.e.* undue) experimentation;[91] rather he could only make an incandescent lamp made of carbonized paper. The scope of Sawyer and Man's contribution—an incandescent lamp made of carbonized paper—did not match the scope of their broad claim.

The logical conclusion of this framework is that the patent's specification must teach how to make and use every embodiment that is covered by a claim,[92] which I shall call the "full scope" rule. Again, the teaching need not be explicit, in that a person of ordinary skill in the art can apply principles generally known at the time of patent filing to constructively understand an embodiment as disclosed if only minor changes are made. But, nonetheless, the specification must contain enough detail that the "full scope" of the claim can be built by a

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[84] *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247, 1254 (Fed. Cir. 2004)

[85] 159 U.S. 465 (1895).

[86] *Id.* at 472.

[87] *Id.* at 471.

[88] In fact, they also filed a claim covering just incandescent lamps using carbonized paper, which was conceded to be not infringed. *Id.* at 472.

[89] *Id.* at 468.

[90] *Id.* at 472.

[91] *Id.* at 475.

[92] Merges & Nelson, *supra* at note 28, at 845 ("Under section 112, the disclosure must be sufficient to enable someone skilled in the art to make and use all the embodiments of the invention claimed in the patent.").

reader of the patent at the time of its filing, using only the conventional skill of the art.[93]

Similar to the enablement requirement, the written description requirement requires a patentee to describe the invention in the specification, so that an ordinary reader can discern "possession" of the claimed invention at the time of filing.[94] Although phrased as two separate requirements, in practice the enablement and written description requirements are basically coextensive.[95] Filing a specification proves possession of what is taught within; and teaching how to make and use something shows possession of it.[96] Like enablement, therefore, written description doctrine is based on the unitary invention principle and the idea of *quid pro quo*.[97] The patentee may only claim those embodiments to which he shows possession at the time of filing the patent, since those represent his "invention" and social contribution.[98]

All of which makes apparent sense, except that a literal application of the "full scope" rule would invalidate *every* patent in existence. This is because every patent claim covers embodiments that are not taught

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[93] *Liebel-Flarsheim Co. v. Medrad, Inc.*, 481 F.3d 1371, 1378-79 (Fed. Cir. 2007).

[94] *ICU Med., Inc. v. Alaris Med. Sys., Inc.*, 558 F.3d 1368, 1376-77 (Fed. Cir. 2009).

[95] *LizardTech, Inc. v. Earth Resource Mapping, Inc.*, 424 F.3d 1336, 1345 (Fed. Cir. 2005).

[96] *Moba, B.V. v. Diamond Automation, Inc.*, 325 F.3d 1306, 1326 (Fed. Cir. 2003) (Rader, J., concurring) ("to enable is to show possession, and to show possession is to enable"); Timothy R. Holbrook, *Possession in Patent Law*, 59 SMU L. Rev. 123, 146-47 (2006) (arguing that enablement should be conceptualized as possession); Mark D. Janis, *On Courts Herding Cats: Contending with the "Written Description" Requirement (and Other Unruly Patent Disclosure Doctrines)*, 2 Wash. U.J.L. & Pol'y 55, 62-63 (2000) (arguing that no court "has ever articulated a persuasive rationale for distinguishing the written description requirement from the enablement requirement").

[97] *Enzo Biochem, Inc. v. Gen-Probe Inc.*, 323 F.3d 956, 970 (Fed. Cir. 2002).

[98] *Univ. of Rochester v. G.D. Searle & Co.*, 358 F.3d 916, 920 (Fed. Cir. 2004) ("[T]he purpose of the written description requirement is to ensure that the scope of the right to exclude, as set forth in the claims, does not overreach the scope of the inventor's contribution to the field of art as described in the patent specification." (internal quotation omitted)); *see PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1306-07 (Fed. Cir. 2008) (holding that a specification describing one type of "customer interface"—vending machines—did not show possession of other types of interface, such as remote laptop computers).

by the specification.[99] As mentioned earlier, a claim is generally "open," in that it covers every material, color, and added part, unless such variations are expressly disclaimed.[100] Thus, a claim to a table stating "an apparatus comprising a flat surface and four legs" encompasses an infinite variety of tables of every different size and material, with added drawers and wheels. A specification cannot implicitly teach all of these variants, even if supplemented with "ordinary skill." Consider whether a patentee can teach how to build a table the size of a planet: even with modern technology such a task is impossible. But a straightforward claim to a table ("an apparatus with a flat surface and four legs") would cover tables the size of a planet; as well as tables using new materials that have yet to be invented.[101]

To require a specification teach how to build *every* claimed embodiment is thus to demand the impossible. Moreover, almost everybody would agree that claim coverage *should* reach some variations that the specification does not teach how to make.[102] For example, I may invent a table in the Bronze Age, before iron is invented. My specification cannot possibly teach iron tables. But if I am limited to tables made from bronze, the patent becomes outdated the minute that iron (or any other material better than bronze) is developed, *even if the iron table uses the same principles of geometry I developed*. Similarly, the first inventor of a computer could not have built modern computers, which are much faster and smaller, but still use many of the same principles; and the Wright Brothers could not have built a World War I fighter plane (which stayed in the air much longer than the original Wright Brothers glider),[103] let alone a modern

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[99] *See* Jeffrey A. Lefstin, *The Formal Structure of Patent Law and the Limits of Enablement*, 23 Berkeley Tech. L.J. 1141, 1168 (2008) (stating that every claim covers "infinite" embodiments).

[100] *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."); see text accompanying note 23, *supra*.

[101] *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, 516-20 (2008) (describing the coverage of open claims over after-arising technology).

[102] It should be noted that the two formulations are equivalent. To require that the specification teach all claimed embodiments is to limit claims to the embodiments taught by the specification. The "full scope" rule can be described as "claim coverage = specification teaching," or vice versa.

[103] G.D. Padfield & B. Lawrence, *The Birth of Flight Control: An Engineering Analysis of the Wright Brothers' 1902 Glider*, 107 Aeronautical Journal 697, 717 (2003) ("after 1908 the rate of progress in aviation was quite startling; progress which, in many ways, would leave the Wright brothers behind").

jet, even though we are still using the same basic flight control system they devised.[104] The point is that, if patent scope is limited to those embodiments the patentee could build at the time of filing (and thus describe in the specification), then every patent becomes worthless practically from the moment it is issued, since incremental changes in technology will quickly create improved embodiments that the original inventor could not have built, but which still rely on many of the same ideas and principles of operation.[105]

In acknowledgement of this reality, a second line of cases holds that teaching *one* working embodiment satisfies the enablement and written description requirements.[106] I shall call this the "one-embodiment-enables-everything" rule. For example, in *Invitrogen Corp. v. Clontech Laboratories, Inc.*,[107] the Federal Circuit held that "the enablement requirement is met if the description enables any mode of making and using the invention."[108] It further explained:

> Enablement does not require the inventor to foresee every means of implementing an invention at pains of losing his patent franchise. Were it otherwise, claimed inventions would not include improved modes of practicing those inventions. Such narrow patent rights would rapidly become worthless as new modes of practicing the invention developed, and the inventor would lose the benefit of the patent bargain.[109]

Moreover, the Federal Circuit has specifically held that a competitor's product can be infringing without being enabled by the

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[104] *Id.* at 698 ("their solution to three-axis control, linking roll and yaw control to mitigate the powerful adverse yaw effects, was one of 'the' critical breakthroughs in the history of aviation and aeronautical engineering.").

[105] *Morley Sewing Mach. Co. v. Lancaster*, 129 U.S. 263, 273 (1889) ("all subsequent machines which employ substantially the same means to accomplish the same result are infringements, although the subsequent machine may contain improvements").

[106] *Tilghman v. Proctor*, 102 U.S. 707, 728 (1880) (requiring "a description of the process and of one practical mode in which it may be applied."); *see also Spectra-Physics, Inc. v. Coherent, Inc.*, 827 F.2d 1524, 1533 (Fed. Cir. 1987) (claim not invalid even if it "reads on another embodiment of the invention which is inadequately disclosed").

[107] 429 F.3d 1052 (Fed. Cir. 2005)

[108] *Id.* at 1071 (quoting *Johns Hopkins Univ. v. CellPro, Inc.*, 152 F.3d 1342, 1361 (Fed. Cir. 1998)).

[109] *Id.*

patentee's specification.[110] This follows from the doctrine that patentees should be able to cover new variants and improvements. But it poses a contradiction for the *quid pro quo* theory of patents and the unitary invention principle. After all, if the patentee should enable the full scope of his claim, and the infringing product falls within the claim, then a logical application of the unitary invention framework would require enabling the accused product. The fact that this is not required exposes the unacceptable policy consequences of strictly following the "full scope" rule in all cases.

One way that courts have attempted to reconcile these two lines of cases is to hold that "after-arising" technology needs not be taught,[111] but all other claimed embodiments must be.[112] This, however, is simply a restatement of the "one-embodiment-enables-everything" rule in disguise. To see why, consider that everything in the universe is one of three things, divided temporally: (1) *pre-existing* technology or prior art; (2) the embodiments taught by the patentee *at filing*; and (3) after-arising technology.[113] Category (1) is unpatentable anyway, on novelty grounds.[114] Category (2) is by definition what has been enabled by the patentee. If category (3) needs not be taught but can still be claimed;[115] then all that is required for a valid claim is for *something* to fall within category (2), meaning one working embodiment would allow for unlimited claiming. Unsurprisingly, given that this doctrine simply restates the "one-embodiment-enables-everything" rule in different words, it is contradicted by numerous other cases requiring the full claim scope—including after-arising technology—to be taught.[116]

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[110] *Durel Corp. v. Osram Sylvania Inc.*, 256 F.3d 1298, 1306 (Fed. Cir. 2001) ("The dispositive question of enablement does not turn on whether the accused product is enabled.").

[111] *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247, 1254 (Fed. Cir. 2004) ("The law does not expect an applicant to disclose knowledge invented or developed after the filing date."); *In re Hogan*, 559 F.2d 595, 605-06 (CCPA 1977).

[112] *See Chiron*, 363 F.3d at 1254 (nascent technology must be enabled with specific disclosure).

[113] *See* Kevin Emerson Collins, *Enabling After-Arising Technology*, 34 J. Corp. L. 1083, 1086 (2009) (distinguishing prior art doctrines that scope over pre-filing knowledge from enablement and written description, which limit scope "prospectively").

[114] 35 U.S.C. § 102 (2006).

[115] *See Innogenetics, N.V. v. Abbott Labs.*, 512 F.3d 1363, 1371-72 (Fed. Cir. 2008) ("Our case law allows for after-arising technology to be captured within the literal scope of valid claims that are drafted broadly enough.").

[116] *See, e.g.*, *Incandescent Lamp Patent*, 159 U.S. at 472-74 (invalidity due to failure to teach later-developed bamboo filament); *Auto. Techs. Int'l, Inc. v.*

Two problems are revealed by this analysis. First, the cases are utterly irreconcilable.[117] The "full scope" line of cases requires every claimed embodiment to be taught, while the "one-embodiment-enables-everything" line of cases requires only one claimed embodiment to be taught. A citation to one or the other line of cases can justify any outcome.[118] Litigants are left to wonder whether a patent that discloses one or a few working embodiments and claims many others—which is practically every patent—is valid.[119] Second, each line of cases has serious defects that are responsible for the contrary line. Requiring the teaching of every claimed embodiment is impossible and invalidates every patent. On the other hand, to say that teaching one working embodiment satisfies the enablement requirement leaves no limit on patent scope. After creating one working embodiment, a patentee could then claim "everything new and non-obvious in the universe," without an obvious doctrine to strike that claim down.[120] A less extreme version of this tactic, but with the same sense of unfairness, is precisely what Samuel Morse and Sawyer and Man tried—claiming very broad categories such as all uses of electromagnetism, or all fibrous and textile materials.[121] Thus, under current doctrine, there is neither a predictable rule for determining patent scope, nor even a theoretical framework for how such a rule might be devised.

II. INVENTION IN MULTIPLE LEVELS OF ABSTRACTION

A better way to understanding the patent scope problem is to consider the specification and the claim separately, without the

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BMW of N. Am., Inc., 501 F.3d 1274, 1284 (Fed. Cir. 2007) (invalidity due to failure to enable later-developed electronic sensor).

[117] *See* Bernard H. Chao, *Rethinking Enablement in the Predictable Arts*, 2009 Stan. Tech. L. Rev. 3, ¶¶ 50–52 (discussing the Federal Circuit split).

[118] Of course, if *no* working embodiment is disclosed, everyone can agree that the patent is invalid, since it has no utility. *Brenner v. Manson*, 383 U.S. 519, 535 (1966).

[119] *See Lizardtech, Inc. v. Earth Resource Mapping, Inc.*, 433 F.3d 1373, 1376 (Fed. Cir. 2006) (Rader, J., dissenting from denial of *en banc*) ("an issue common to many patent disputes [is] claims that are broader than the disclosed embodiments").

[120] Such a claim would fail the PTO's procedural requirements for claim form. *Ex parte Fressola*, 27 U.S.P.Q.2d 1608, 1612 (Bd. Pat. App. & Inter. 1993). However, these procedural requirements have never been judicially endorsed. *See Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 27 n.4 (1997) (stating that the PTO's modern claiming practice "is not of statutory origin" and abandonment of prior forms "may be overstated").

[121] See text accompanying notes 85–91, *supra*.

rhetoric of these describing a unitary "invention."[122] The specification describes an *embodiment*; and the claim describes an *idea*. Rather than thinking of these two components of a patent as reaching the same conclusion through different means,[123] it is better to understand that they represent fundamentally different concepts, with only tangential relation to each other.

A. The Two Concepts of Invention

1. Invention as a specification embodiment.

Section 112 of the patent statute states that the "specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art . . . to make and use the same." Although the statute speaks of an "invention," in practice what section 112 requires is description of a tangible and working embodiment, such as a physical process or a machine. It is not possible to "make" intangible ideas, only embodiments.[124] An invention, for the specification, must be "embodied [ ] in some distinct form,"[125] meaning a physical embodiment.[126]

2. Invention as a claimed idea.

Although the law has always required the invention in the specification to be embodied in distinct form, it has equally recognized substance, not form, defines patent protection.[127] In ascertaining

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[122] Emerson Stringham, *Double Patenting* 209 (1933) ("This primitive confusion of 'invention' in the sense of physical embodiment with 'invention' in the sense of definition of the patentable . . . survives to the present day, not only in the courts, but among some examiners in the Patent Office.").

[123] *See, e.g.*, *University Of Rochester v. G.D. Searle & Co.*, 358 F.3d 916, 922 & n.5 (Fed. Cir. 2004) ("while the role of the claims is to give public notice of the subject matter that is protected, the role of the specification is to teach, both what the invention is (written description) and how to make and use it (enablement)"); *SRI Int'l v. Matsushita Elec. Corp. of Am.*, 775 F.2d 1107, 1121 & n.14 (Fed. Cir. 1985) (*en banc*) ("Specifications teach. Claims claim.").

[124] Howard T. Markey, *Why Not the Statute?*, 65 J. Pat. Off Soc'y 331, 333 (1983) ("Ideas are never patentable. Only embodiments of an idea, i.e. an invention, may be patented.").

[125] *Seymour v. Osborne*, 78 U.S. 516, 552 (1870).

[126] *See In re Bilski*, 545 F.3d 943 (Fed. Cir. 2008) (*en banc*) (machine or transformation required for processes); *In re Nuijten*, 500 F.3d 1346, 1356 (Fed. Cir. 2007) (patentable products must be tangible).

[127] *See, e.g.*, *Winans v. Denmead*, 56 U.S. (15 How.) 330, 343 (1853) ("it is the duty of courts and juries to *look through the form for the substance of the invention* -- for that which entitled the inventor to his patent, and which the patent was designed to secure" (emphasis added)).

patent scope, the claim should articulate the "principle" underlying the patent.[128] In other words, claims define an *idea*, and a claimed idea defines patent scope. In this second sense of the word, "invention" refers to an intellectual idea.[129]

To say that patent scope covers an idea, of course, does not mean that merely thinking about the idea infringes: a physical embodiment of the idea is still required for infringement.[130] The point is that the infringer's embodiment may bear absolutely no resemblance to the *patented* embodiment, except that they share an overlapping "principle" or "idea" at a certain level of abstraction. For example, a pill and a radiation machine have nothing in common in their structure, operation or appearance; but if both cure the same disease, the pill may infringe an idea embodied by the radiation machine when considered at a high level of abstraction. Specifically, both pill and machine share the idea of curing that disease.

3. Differences in concept, not just in approach.

Although the differences between an idea and embodiment are well known, courts and commentators have elided the differences between them using the rhetoric of a unitary "invention," with the specification and claims describing different facets of the same thing.[131] When forced to clarify what an "invention" really is, however, leading authorities take directly contradictory approaches.

Chief Judge Howard Markey of the Federal Circuit, one of the preeminent judges of patent law, has characterized an "invention" as the embodiment described by a specification. According to Chief Judge Markey, "[i]deas are never patentable. Only embodiments of an idea,

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[128] *See* Merges & Duffy, *supra* at note 23, at 27 ("For purposes of the patent law, an invention is only the concept or principle that is articulated in the patent claim.").

[129] *See Pfaff v. Wells Elecs., Inc.*, 525 U.S. 55, 60 (1998) ("The primary meaning of the word "invention" in the Patent Act unquestionably refers to the inventor's conception rather than to a physical embodiment of that idea.").

[130] *See In re Comiskey*, 499 F.3d 1365, 1376 (Fed. Cir. 2007) (a pure mental process is not patentable); *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1354 (Fed. Cir. 2005) (claim to an "aesthetically pleasing" appearance was invalid because it was impossible to objectively determine infringement); *see also* Kevin Emerson Collins, *Constructive Nonviolition in Patent Law*, 2007 Wis. L. Rev. 759, 799 (2007) (arguing for a "constructive nonviolition" defense to infringement by mental processes).

[131] *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd.*, 535 U.S. 722, 736 (2002) ("What is claimed by the patent application must be the same as what is disclosed in the specification.").

i.e. an invention, may be patented."[132] Moreover, "idea" is a "mud word" that "appears nowhere in the statute, which speaks only of invention."[133] This view of invention as embodiment is supported by solid Supreme Court precedent,[134] as well as the statute that defines patentable inventions as tangible machines, products, and processes.[135]

On the other side, Judge Giles Rich of the Federal Circuit, another preeminent judge who wrote much of the Patent Act, has opined that an "invention" is an abstract idea. According to Judge Rich, an invention is "an incorporeal, intangible abstraction in the nature of a product of the mind." [136] An embodiment is "[p]opularly but inaccurately called 'invention.'"[137] This view, too, has ample support in Supreme Court precedent, which states that "[t]he primary meaning of the word 'invention' in the Patent Act unquestionably refers to the inventor's conception rather than to a physical embodiment of that idea."[138]

Taken to their extreme, the two concepts of "invention" are irreconcilable with each other. An invention cannot both be an intangible idea and a tangible thing at the same time. But "invention" can mean different things in different contexts. When speaking about the specification disclosure, the statute uses "invention" to denote the patentee's tangible creation, which must be novel and useful, and must be adequately described so that it can be built. When speaking about claims and infringement, the statute uses "invention" to denote an idea that others may not utilize, and a third-party infringes the patent by using the same idea, even if it is embodied in a different form compared to the specification embodiment.

Thus far, all I have provided is a simple description of the reality of patent practice, which every practitioner intuitively understands.[139] But if invention means different things across different contexts—if idea and embodiment are not the same thing described in different ways—then the unitary invention framework collapses. This is because every embodiment contains many ideas, at different levels of

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[132] Markey, *supra* at note 124, at 333.

[133] *Id.*

[134] *Seymour v. Osborne*, 78 U.S. 516, 552 (1870).

[135] 35 U.S.C. § 101 (2006).

[136] Giles S. Rich, *The Relation Between Patent Practices and the Anti-Monopoly Laws—Part II*, 24 J. Pat. Office Soc'y 159 (1942), *reprinted in*, 14 Fed. Cir. B.J. 21, 29 (2004).

[137] *Id.* at 30.

[138] *Pfaff*, 525 U.S. at 60.

[139] Ronald D. Slusky, *Invention Analysis and Claiming: A Patent Lawyer's Guide* 5 (2007) ("an invention is an abstraction").

abstraction. There is no automatic correlation between embodiment (contribution) and idea (monopoly scope). Moreover, it is not helpful to consider the specification "invention" when defining the claimed "invention";[140] because they are apples and oranges.

B. Claiming Ideas at Multiple Levels of Abstraction

The two differing concepts of "invention" creates a problem for defining patent scope. Because patent law requires the specification to describe the embodiment, and because many ideas are embodied in a single embodiment at different levels of abstraction, it becomes difficult to say that any particular level of generality is "the" idea behind a patented embodiment. Rather, for any specification embodiment, an infinite array of ideas is equally apt for a claim. For example, consider the invention of a radiation machine that cures AIDS. The "invention" can be claimed as:

1. "A cure for AIDS," covering all cures that might ever be devised.

2. "A cure for AIDS using radiation," covering all cures using any type of radiation but not other methods.

3. "A cure for AIDS using X radiation," thereby excluding methods using other types of radiation.

4. "A cure for AIDS using X radiation, specifically by using the exact make and model of the radiation machine in the specification."

As can be seen from this example, the more abstractly the idea is claimed, the broader the resulting patent coverage. On the other hand, the addition of various details results in narrower scope. Indeed, at the end of this spectrum, when a claim specifies the invention in detail down to the last nut, bolt and atom, it ceases to cover an "idea" in the normal sense, and would cover just one precise embodiment. In this sense, a tangible embodiment is just the extreme end point on a spectrum of possible levels of abstraction.

Figure 1: Spectrum of Levels of Abstraction

Embodiment Narrow Idea Broad Idea Fundamental Principle

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[140] Stringham, *supra* at note 122, at 209 ("In patent law there is no possibility of clear thinking until it is understood that an 'invention' as protected . . . is an abstraction, an idea of means.").

Thus, an embodiment would be the precise radiation machine used to cure AIDS down to the last atom. A narrow idea would be using a particular type of radiation (e.g. X radiation) to cure AIDS. A broad idea would be to use any type of radiation to cure AIDS. A fundamental principle would be the idea of curing AIDS itself, or the idea of curing any previously incurable disease. Notably, the other criteria of patentability do not limit abstraction: all of the above ideas are new, useful, and non-obvious, since no one has cured AIDS before.

Within the spectrum of abstractions, each description is equally accurate as any other. No inventor will create *every* iteration of a claimed idea; rather, an inventor creates one or more embodiments[141] and claims the idea more generally. A patent to a new type of radiation machine that cures AIDS always has an underlying embodiment that has a specific type of radiation, a specific material, specific nuts and bolts, a specific paint color, and, to be extreme, a specific number of atoms—the patentee just omits all those details in a claim. Thomas Edison did not create every variation of the incandescent lamp; he created *one* incandescent lamp and abstracted out his claim. The Wright Brothers did not create every variation of an airplane; they created *one* barely working glider and abstracted out its description. The question is simply whether the details of the inventor's embodiment should be specified in the claim—their omission increases abstractness and scope, and the inclusion of more detail reduces scope. There is almost no limit on how far one can move up or down the abstractions ladder, from claiming "all things new, useful and non-obvious,"[142] to specifying a product down to the last atom and even the last sub-atomic particle.

The degree of abstraction that the law will protect as a *valid* patent claim has tremendous consequences for both the incentives created by the patent system and the rights of subsequent improvers and users. A patent covering the broad idea of curing AIDS would entitle the patentee to all cures for AIDS, even a later cure that used a pill instead of radiation. This would provide great incentive to obtain the patent, but impedes later research since a later inventor who invents a cure with a pill would infringe the earlier broad patent. A narrower patent creates the opposite problem, in that it facilitates later

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[141] Again, by "create," I refer to either actual or constructive creation. The inventor may actually build the embodiment, or instead describe it in such detail in the specification that others can build it. See note 24, *supra*.

[142] As previously noted, the PTO has form requirements that indirectly limit breadth, for example by prohibiting "omnibus" claims like the one in-text. See note 120, *supra*. Other PTO requirements of claim form can also create more detailed, and thus narrower, claims. *See* Merges & Duffy, *supra* at note 23, at 30 (describing PTO form requirements).

improvements that are not literal copies (literal copies will infringe no matter how narrow the patent), but a patent covering only the specific embodiment is essentially worthless because even a pure pirate who does no research can avoid infringement by changing the paint color.[143]

This task of selecting patent scope is thus a matter of determining which level of abstraction the law will protect.[144] Understanding the levels of abstraction inherent in an invention sheds much light on current scope doctrine and its problems.

C. Understanding the Claim Construction Debate

Once we understanding that claimed ideas exist on multiple levels of abstraction, the conflicts in claim construction are more accurately viewed as disagreements over *policy*, not over textual methods.

1. Debunking the linguistic vagueness rationale.

Normally, claim construction is framed as a debate between two interpretative schools: textualists who look primarily to dictionary meaning of claim language, and contextualists who look primarily to the specification embodiment for context.[145] Thus, textualists give greater weight to the canon against importing limitations from the specification; while contextualists give greater weight to the canon that claims must be interpreted in light of the specification. Common to both schools, however, is a core framework. Both schools agree that claim construction is a *formalist* interpretive exercise, to *neutrally* ascertain the meaning of claim language.[146] The enemy of both schools remains the judge who twists text to reach a particular outcome.[147]

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[143] Adelman *et al.*, supra at note 11, at 459.

[144] *See* Burk & Lemley, *supra* at note 12 (arguing that there is no right level of abstraction when construing claim limitations).

[145] *See* Craig Allen Nard, *A Theory of Claim Interpretation*, 14 Harv. J.L. & Tech. 1, 5 (2001) (characterizing the two schools as "hypertextualistism" and "pragmatic textualistism"); R. Polk Wagner & Lee Petherbridge, *Is the Federal Circuit Succeeding? An Empirical Assessment of Judicial Performance*, 152 U. Pa. L. Rev. 1105 (2004) (describing the two schools as "procedural" versus "holistic").

[146] *Scripps Clinic & Research Found. v. Genentech, Inc.*, 927 F.2d 1565, 1580 (Fed. Cir. 1991) ("the construction of claims is simply a way of elaborating the normally terse claim language: in order to understand and explain, but not to change, the scope of the claims").

[147] *SRI Int'l v. Matsushita Elec. Corp. of Am.*, 775 F.2d 1107, 1118 (Fed. Cir. 1985) (*en banc*).

The formalist framework characterizes the claim construction problem as one of *linguistic vagueness.*[148] As shown by *Kinetic Concepts*, when the patentee claims "wound" treatment generically but the specification discloses only skin wounds, the court finds this linguistically vague.[149] After all, the specification describes the invention just as much as the claims, and so the patentee *couldn't* have meant all wounds, since the specification doesn't describe all types of wounds. Similar is the more recent case of *Phillips v. AWH Corp.*,[150] where the patentee disclosed walls with internal "baffles" only at specified angles, but claimed "baffles" generically, and the issue was whether the invention was limited to baffles of only the angles disclosed by the specification.

The levels of abstraction framework brings clarity to what is really going on in the current claim construction debate. First, the problem is rarely linguistic ambiguity or vagueness. As the drafter of patent claim language, *of course* the patentee prefers to cover all wounds, and baffles of all angles, and as many embodiments and variants as the law will allow.[151] There is nothing ambiguous, vague, incoherent, or even surprising about the patentee trying to move up the abstraction ladder to gain more scope when drafting the claim. The only reason that courts would think so is because of the unitary invention principle treating the claim and the specification as a single "invention."

Second, courts that treat the claim construction problem as one of linguistic vagueness fundamentally misunderstand what "vagueness" means. A idea is vague if its boundaries are hard to determine,[152] with the number of borderline cases high. An idea is abstract if it lacks

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[148] *See, e.g.*, Kristen Osenga, *Linguistics and Patent Claim Construction*, 38 Rutgers L.J. 61, 84 (2006) (arguing for greater use of linguistic techniques in claim construction).

[149] See text accompanying notes 55–58, *supra*.

[150] 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*).

[151] Faber, *supra* at 20, at § 10:1.1 ("coverage should be as broad as possible."). The qualification of "as the law will allow" is important. A patentee would prefer a narrow claim construction if the broad construction will encompass later discovered prior art, and thus invalidate the patent for lack of novelty. Mark A. Lemley, *The Changing Meaning of Patent Claim Terms*, 104 Mich. L. Rev. 105, 117 (2005). But this type of *ex post* position adjustment is disingenuous, since *at the time the claim is drafted*, the patentee would have intended the more generic scope. See Part III.C (discussing *ex ante* incentive problems created by modifying scope in response to post-filing information).

[152] *See* Stanford Encyclopedia of Philosophy, Vagueness, http://plato.stanford.edu/entries/vagueness/ (last visited June 20, 2009) (comparing the concepts of ambiguity, vagueness, and generality).

specific context. The idea of a prime number (a number divisible only by itself and one), is abstract but not vague. A prime number is extremely abstract because it can be applied across many contexts and would make a very broad patent claim if allowed.[153] But it is perfectly easy to determine whether a number is a prime number, and thus it is not vague. This is true in the reverse. The word "tall" is vague, but it is not abstract. The question, "Is Mr. Smith tall?" is vague and difficult to answer, even if we know Mr. Smith is 5'9", because there is no bright-line height cut-off and 5'9" is a borderline case. But it is not abstract, because it refers to one person and the specific attribute of his height.

When courts find generic and abstract claims "vague," they are mistaking vagueness for abstraction. The two are different, though often confused. "Baffles at any angle" is more abstract than "baffles at 90 degrees," but both are equally vague. It is as easy to determine whether something is a baffle at any angle at it is to determine whether something is not a baffle at 90 degrees. Similarly, it is as easy to determine whether something is a wound *anywhere* at it is to determine whether something is a wound *on the skin*. Indeed, importing the limitation of "skin" potentially makes the claim *more* vague. In addition to determining whether something is a "wound"; we also have to determine whether it counts as "skin."[154]

The reason that courts think that importing limitations from the specification makes a claim more clear is that, while the overall zone of uncertainty may be unchanged or even increased, the location of the uncertainty moves—so the result for one particular accused product becomes easier to determine. The diagram below illustrates this.

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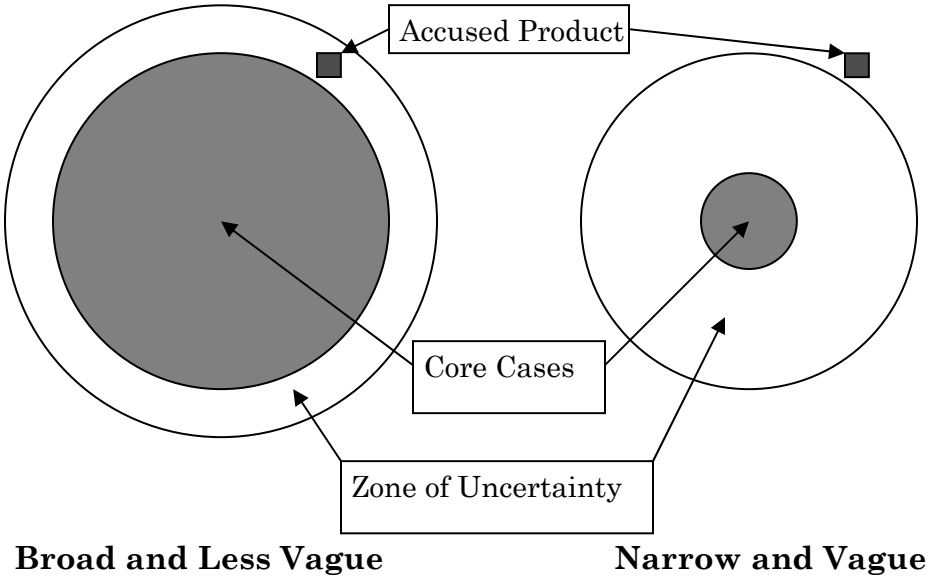
[153] Prime numbers are used in numerous contexts such as encryption technology. Alfred J. Menezes, Paul C. van Oorschot & Scott A. Vanstone, *Handbook of Applied Cryptography* 286 (1996). Its abstractness comes from specifying no particular one. For reasons unrelated to claim construction or enablement, extremely abstract claims such as those on prime numbers are not allowed. *Gottschalk v. Benson*, 409 U.S. 63 (1972) (patent on fundamental ideas not permitted)..

[154] These "construction of the construction" disputes are common. *See, e.g.*, *Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1159-60 (Fed. Cir. 2007); *SafeTCare Mfg., Inc. v. Tele-Made, Inc.*, 497 F.3d 1262 (Fed. Cir. 2007).

Figure 2: Abstraction Versus Vagueness



As shown by the diagram, when courts import limitations such as "skin" or a particular angle, they are not really reducing the vagueness of the claim. In fact, they are often increasing the zone of uncertainty, because now there are more variables to dispute. But at the same time as increasing vagueness, they reduce abstraction and scope. The effect is that an accused product that once fell within the zone of uncertainty no longer does so. So the claim becomes, superficially, more determinate. In fact, the opposite has occurred.

The confusion of abstraction for vagueness has serious consequences. Vagueness can be resolved by formalist textual methods because has no normative dimension: all else being equal, clearer is better when it comes to property boundaries like claims.[155] In contrast, abstraction—which directly translates into scope—has a normative dimension that textual methods will never answer, namely how much scope is desirable. For example, as the *Kinetic Concepts* court frankly acknowledged, the "construction" occurring is simply narrowing an abstractly-worded claim that would otherwise "expand the scope of the

[155] *See Merrill v. Yeomans*, 94 U.S. 568, 573 (1876) ("no excuse for ambiguous language or vague descriptions"). Of course, all else is not always equal, and perfect clarity might entail excessive transaction costs. *See* Douglas Lichtman, *Substitutes for the Doctrine of Equivalents: A Response to Meurer and Nard*, 93 Geo. L.J. 2013, 2016 (2005) (arguing that drafting perfect claims is too difficult).

claims far beyond anything described in the specification."[156] No amount of textual interpretation will tell us how much broader the claim *should* be compared to the specification embodiment, or how "far beyond" the specification is *too* far, triggering the need to construe the claim ore narrowly. Textual interpretation can only tell us how much broader the claim *is*, which does not answer the current claim construction inquiry with its (largely unnoticed) policy focus.

2. Claim construction as an abstraction-oriented inquiry.

Rather than linguistic vagueness, the disagreement between the two claim construction camps is over the level of generality permitted. Interpreting claims in light of the specification—or, to say the same thing in different words, importing limitations from the specification—has the effect of reducing the abstractness of a claim and its corresponding scope. A physical embodiment is the least abstract point on the spectrum: it is specific down to the last atom. A specification description is slightly more abstract than a physical embodiment, because the written description of an embodiment usually omits very minor details such as the precise paint color; but the specification description is still more specific than even the narrowest claim. Thus, the contextualist school predictability results in the substantive effect of *narrower* patent scope, which hews more closely to the specification description and the underlying physical embodiments.[157] In short, the line to "too far" beyond the specification is more easily crossed.

On the other side, giving effect to the plain language of the claim increases the abstractness or generality at which an invention is characterized. Because patentees draft claim language, they naturally draft very general (and hence broad) claims. A court that gives effect to such broad language—drafted by the patentee—will give broader patent scope than one that limits claims using the specification embodiment.[158]

Thus, the debate between the textualists and the contextualists in claim construction is not about neutral linguistic rules and devices, or whether dictionaries of the specification provide better guides to

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[156] *Kinetic Concepts*, 554 F.3d at 1019.

[157] *See* Christopher A. Cotropia, *Patent Claim Interpretation Methodologies and Their Claim Scope Paradigms*, 47 Wm. & Mary L. Rev. 49, 105-109 (2005) (discussing the scope effect of using the specification to interpret claims).

[158] *Cf.* Wagner & Petherbridge, *supra* at note 145, at 1142 (predicting that a procedural (or textualist) approach will yield broader constructions than a holistic (or contextualist) approach).

meaning.[159] The debate is about *when* and *whether* the claim should substantively be allowed to cover more embodiments than disclosed by the specification. What is the right level of generality? To use the language of *Kinetic Concepts*, how far from the specification embodiment is "too far"?[160] Whether patents should be broad or narrow is, like whether the patent term should be long or short, a matter of policy.[161] The core failure of current claim construction doctrine is that nobody knows where the line is on what constitutes "too far," because the judges disagree on where the normative line lies.

Thus far, all I have done is describe how current doctrine actually operates. The levels of abstraction framework also provides normative insights into how to reform current claim construction doctrine. The biggest policy dilemma—whether and when patent scope should exceed the specification embodiment—I will address in Part III. In addition to that core question, however, other aspect of claim construction doctrine can be clarified.

The easiest reform pertains to the use of the word "invention" the specification. Based on the unitary invention framework, courts currently place enormous weight on uses of that word. Thus, for example, if the specification says "the invention is a radiation machine emitting X radiation that cures AIDS," courts will almost always treat every element of that sentence as mandatorily implied into every later claim.[162] Thus, even if the patentee writes a far more abstract claim, *e.g.* "a cure for AIDS," a court would reason that the language is really linguistically vague "in light of the specification," that the "invention" (per the specification) is really a machine that emits X radiation and cures AIDS, and *viola*, the claim language really requires a machine that emits X radiation, and does not cover a pill that cures AIDS or a machine emitting Y radiation.

The same doctrine applies to statements made during prosecution to the PTO. Although statements in the prosecution history must be

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[159] *See Phillips v. AWH Corp.*, 376 F.3d 1382 (Fed. Cir. 2004) (*en banc*) (order granting en banc asking: "Is the public notice function of patent claims better served by referencing primarily to technical and general purpose dictionaries and similar sources to interpret a claim term or by looking primarily to the patentee's use of the term in the specification?").

[160] See text accompanying note 156.

[161] Merges & Nelson, *supra* at note 28, at 842 (discussing economic effects of varying patent scope).

[162] *See, e.g.*, *Honeywell Int'l, Inc. v. ITT Indus., Inc.*, 452 F.3d 1312, 1318 (Fed. Cir. 2006) (claim to "fuel injection system component" covered only fuel filters because specification described fuel filter as "the present invention"); *C.R. Bard, Inc. v. U.S. Surgical Corp.*, 388 F.3d 858, 864 (Fed. Cir. 2004).

"clear and unmistakable" to be given effect,[163] if the patentee states that his "invention" is one thing or another, those elements are implied into every later claim.[164] The result is a trap for the unwary and the impecunious,[165] making patent prosecution and patent documents ever more expensive and complex.

The fallacy of this approach is that it, once again, confuses the two concepts of "invention." The invention in the specification is an embodiment, and necessarily has physical details such as taking the form of a machine and emitting only one particular type of radiation. But the invention in the claim is an idea, which is more abstract and can take many different forms, without the details of an embodiment. To say that the patentee described one thing in the specification and thus is bound to the same thing in the claim simply perpetuates the confusion created by meshing these two concepts.

A more general reform is to remove the nexus between the specification and the claim from the claim construction calculus entirely. In theory, a court should look to the specification and prosecution history to construe claim language because they represent a unitary invention; and because these are the sources that an ordinary reader of the claim would look to.[166] Neither of these rationales holds water. The first has obvious defects. And the theory that an ordinary reader of a claim would look to the specification for context is a circular bootstrap argument. Claims are legal instruments to be enforced by courts,[167] and the only motive for someone to read claims would be to predict what scope a court would give the patent.[168] Why else would normally sane people interpret claims by following a convoluted process of first reading the specification, second combing through the prosecution history (usually the size of a telephone book),

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[163] *Cordis Corp. v. Medtronic Ave, Inc.*, 339 F.3d 1352, 1359 (Fed. Cir. 2003).

[164] *See Regents of University of Cal. v. Dakocytomation Cal., Inc.*, 517 F.3d 1364, 1372-74 (Fed. Cir. 2008) (finding prosecution disclaimer).

[165] Seasoned attorneys know better than to use such a loaded word. *See* Slusky, *supra* at note 139, at 217 (advising drafters to double-check "every mention of the word 'invention' in the specification"); David Pressman, *Patent It Yourself* 193 (13th ed. 2008) ("don't use the word invention anywhere in your application").

[166] *Phillips*, 415 F.3d at 1313. The predicate assumption b

[167] *See* Merges & Duffy, *supra* at note 23, at 26 ("The function of claims is only to define the precise scope of the intellectual property rights.").

[168] *See* Janice M. Mueller, *A Rich Legacy*, 81 J. Pat. & Trademark Off. Soc'y 755, 758-59 (1999) ("the sole function of patent claims" is "to find out what the patentee can exclude the defendant from doing" (quoting remarks of Judge Giles S. Rich)).

and third examining extrinsic evidence?[169] The only reason is that *courts* say claims should be interpreted in this way.[170] Thus, courts interpret a claim according to how a ordinary reader would understand them, but an ordinary reader interprets claims to mean whatever the courts say. Like other manifestations of the unitary invention principle, the result of this circularity is indeterminacy and confusion, which a separation of claimed ideas from the specification embodiment will help to alleviate.

D. Enablement, Scope, and Undue Experimentation

The levels of abstraction framework also brings the problems of the enablement standard into sharper relief. The enablement inquiry that asks whether the specification permits a person of ordinary skill in the art to "make" the "full scope of the claim" poses an almost-nonsensical question, once the real nature of a claim is understood. Since the claimed "invention" is an abstraction—an idea—it is impossible to "make" anything so intangible.[171] Nor is it ever possible to teach how to make every embodiment that encompasses the idea, due to the fact that even minor technological advances will quickly permit new embodiments to incorporate the idea while rendering even the most detailed specification teaching outdated.[172]

This is not to say that the concept of making the invention without undue experimentation by a person of ordinary skill has no relevance. But it pertains only to *embodiments*, or the "invention" of the specification. In other words, current enablement doctrine reflects two distinct functions. The first, to ensure that the specification contains a working embodiment, fits coherently into the "make without undue experimentation" test. The second, to ensure that the idea claimed is adequately disclosed in the specification, does not fit because ideas cannot be "made" in the first place. Merging these distinct purposes into a single test means that the second function—idea claiming and scope determination—has been ill-served.

Having at least one working embodiment is important, since that is the basis of the patentee's contribution. At the same time, it makes sense to remember that no embodiment works unfailingly: drugs rarely achieve 100% effectiveness, computers crash, and light bulbs burn out.

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[169] *See Phillips*, 415 F.3d at 1315-18 (laying out this hierarchy).

[170] *Cf.* John M. Golden, *Construing Patent Claims According to Their "Interpretative Community": A Call for an Attorney-Plus-Artisan Perspective*, 21 Harv. J.L & Tech. 321, 334 (claim construction rules are "far more tailored to determining . . . the views of an ordinary patent lawyer than those of an ordinary artisan").

[171] See Part II.A.

[172] See text accompanying notes 99–104.

Some degree of experimentation and tolerance for failure is required. Thus, in asking what embodiments the patentee *has* disclosed, the current test of whether the specification teaches an ordinary person of skill in the art how "to make and use the invention without undue experimentation" makes sense,[173] *as long as the "invention" is understood to refer to a working specification embodiment*. The test tells us how many embodiments the patentee has given society through the patent, including whether he passes the minimum threshold of at least one working embodiment.

The problems faced by the current enablement test are caused by its extension into policing patent scope, and intruding upon the policy question posed by the levels of abstraction framework. Above the minimum floor of protecting against literal replication of what the patentee taught,[174] patent scope becomes a policy question: given the working embodiments taught today, how many *other* embodiments should the patentee get for the next twenty years?[175] In return for *one* or a few working cures for AIDS today, how many *future* variants of the cure for AIDS, which are unknown today and may be better, faster, or cheaper, are we willing to give up over 20 years? This ultimately translates to a question of how broad an idea—which can be incorporated into future embodiments—does the patent law protect?

Under the "full scope" rule, the formalist answer is that no future embodiments can be claimed.[176] But this is unlikely to be the right answer or even the answer in reality.[177] Given the pressing nature of the AIDS crisis and the need to solve it quickly, one cure today is better than two cures in 19 years; and no one wants to invest in

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[173] *In re Wands*, 858 F.2d 731, 736 (Fed. Cir. 1988).

[174] Of course, even under the narrowest formulation of patent scope, the patentee would receive protection against literal replication of the embodiments he has taught, including the embodiments taught constructively.

[175] *See* Janice M. Mueller, *Patent Law* 108 (3d ed. 2009) ("Deceptively simple on its face, the task of awarding the 'right' claim scope for a particular disclosure . . . actually involves a delicate balancing of policy concerns.").

[176] *Nat'l Recovery Techs., Inc. v. Magnetic Separation Sys., Inc.*, 166 F.3d 1190, 1196 (Fed. Cir. 1999) ("The scope of enablement . . . is that which is disclosed in the specification plus the scope of what would be known to one of ordinary skill in the art without undue experimentation.").

[177] Collins, *supra* at note 101, at 558 ("Although patent doctrine requires courts to stabilize the literal scope of a claim at the time of filing, courts routinely allow claims to grow and encompass [after-arising technology]."); Robert P. Merges, *Rent Control in the Patent District: Observations on the Grady-Alexander Thesis*, 78 Va. L. Rev. 359, 379 n.73 (1992) (arguing that courts treat scope differently for enablement and infringement).

researching a cure for AIDS if the resulting patent will likely become outdated very quickly, when slightly improved (but not makeable at the time of filing) cures are discovered. Thus, the true patent bargain is not disclosure in exchange for twenty years of monopoly on the thing disclosed. The true patent bargain is this: one working embodiment today, in exchange for a *broader* monopoly over twenty years,[178] covering some range of future improvements and variants, otherwise known as after-arising technology.[179] The bargain is often worthwhile because a pressing concern of the moment outweighs the later consequences. But determining *how much broader* is an unavoidable policy question, for which formalistic enablement tests provide no answer, or an answer (*i.e.* zero) that is simply unacceptable.[180]

III. A LEGAL REALIST APPROACH TO PATENT SCOPE

A. The Unavoidable Policy Question

Copyright scholars will have noticed the similarity of my analysis to the famous Learned Hand "abstractions test" in copyright law. Judge Hand observed that, in determining whether two non-identical stories were nonetheless "substantially similar," and thus making one an illegal copy of the other,[181] much depended on how abstractly the original story is characterized by the court and the level of generality at which similarity is compared.[182] As Hand put it:

> It is of course essential to any protection of literary property . . . that the right cannot be limited literally to the text, else a plagiarist would escape by immaterial variations. That has never been the law, but, as soon as literal appropriation ceases to be the test, the whole matter is necessarily at large . . . . Upon any work, and especially upon a play, a great number of patterns of

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[178] The patent term expires 20 years from filing. 35 U.S.C. § 154 (2006).

[179] It is worth repeating that *everything* that is not taught by the patentee is either prior art or after-arising technology. See text accompanying notes 111–116, *supra*. Everyone agrees that patents protect against literal replication of embodiments taught by the patentee; and everyone agrees that patents never cover the prior art. Thus, the debate over patent scope can be viewed as one about whether patents can encompass after-arising technology.

[180] *See* Collins, *supra* at note 113, at 1088-89 (arguing that the Federal Circuit in practice applies a "reasonableness" test that is a "fact-intensive, fuzzy, and unclear standard").

[181] A *prima facie* case of copyright infringement is met by proving (1) access to the copyrighted work, and (2) substantial similarity as to protected material between the copyrighted work and the accused work. *See Folio Impressions, Inc. v. Byer California*, 937 F.2d 759, 765 (2d Cir. 1991).

[182] *Nichols v. Universal Pictures Corp.*, 45 F.2d 119, 121 (2d Cir. 1930).

> increasing generality will fit equally well, as more and more of the incident is left out. The last may perhaps be no more than the most general statement of what the play is about, and at times might consist only of its title; but there is a point in this series of abstractions where they are no longer protected . . . . Nobody has ever been able to fix that boundary, and nobody ever can.[183]

To take an example, *Snow White* can be described as a story of a princess living with seven dwarves, eating a poisoned apple from her evil stepmother, and then meeting a handsome prince.[184] To insist on a relatively specific characterization of the story, and requiring every element of the story to be copied for copyright infringement, would allow a pirate to write an almost identical story, but to change the evil stepmother to an evil aunt. But once we start dropping elements, so that the apple can come from anybody, then we are simply moving up the abstraction ladder, "as more and more of the incident is left out."[185] For if the apple does not need to come from an evil stepmother for a subsequent work to plagiarize, then why does there need to be a poisoned apple at all? A story with seven dwarves and a princess meeting a handsome prince still sounds a lot like *Snow White*. The end of this slippery slope is that *Snow White* becomes described very abstractly as a story of "boy meets girl," at which point practically every novel in existence is a "copy."

The process is identical in patent law.[186] From the patentee's original machine that cures AIDS using X radiation, "a great number of patterns of increasing generality will fit equally well."[187] To insist

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[183] *Id.*

[184] Jacob Grimm & Wilhelm Grimm, *Schneewittchen [Snow White]*, *in* The Grimms' German Folk Tales 192 (Francis P. Magoun, Jr. & Alexander H. Krappe trans., S. Ill. Univ. Press 1960).

[185] *Nichols*, 45 F.2d at 121.

[186] Patent scholars have not completely ignored the parallel, though scholarship in this area is limited. *See, e.g.*, Burk & Lemley, *supra* at note 12, at 35; Joshua D. Sarnoff, *Abolishing the Doctrine of Equivalents and Claiming the Future After Festo*, 19 Berkeley Tech. L.J. 1157, 1160 (2004). Others have applied the abstraction concept to patent law's subject-matter eligibility criteria, instead of its scope doctrines such as enablement. *See, e.g.*, Maximilian R. Peterson, Note, *Now You See It, Now You Don't: Was It a Patentable Machine or an Unpatentable "Algorithm"? On Principle and Expediency in Current Patent Law Doctrines Relating to Computer-Implemented Inventions*, 64 Geo. Wash. L. Rev. 90 (1995).

[187] *Nichols*, 45 F.2d at 121; *see also* Peter Lee, *The Evolution of Intellectual Infrastructure*, 83 Wash. L. Rev. 39, 68 n.155 ("an invention, if subjected to a 'great number of patterns of increasing generality,' could be conceptualized as a combination of scientific principles and mechanical forces.").

upon confining the invention to the precise embodiment taught would allowing "the unscrupulous copyist" to escape infringement by making "unimportant and insubstantial changes."[188] But, once we start dropping elements, saying that the precise nuts and bolts taught are not required and any method of assembly will do, there is no natural stopping point on what "incidents" may be left out. If the particular nuts and bolts do not matter, then why does using X radiation in particular matter? The end of the slippery slope is that the invention does not even need to be a machine, at which point the patent covers anything that cures AIDS, including a later invented pill that bears no resemblance to a radiation machine.

The Hand abstractions test has spawned an enormous literature in copyright law, but it remains the case that nobody ever has fixed a rule that distinguishes the level of abstraction that copyright protects from what it does not.[189] There is no legally "correct" answer to the level of abstraction inquiry;[190] or at least the answer will not come from traditional legal sources of statutory text and judicial precedent. Rather, in copyright law, the legal conclusion of whether something is an unprotected idea is "prompted by notions—often unarticulated and unproven—of appropriate competition."[191] As the Ninth Circuit candidly put it, "[t]he guiding consideration in drawing the line is the preservation of the balance between competition and protection reflected in the patent and copyright laws."[192] In short, selecting the level of abstraction is a matter of judge-crafted economic policy.[193]

Acknowledging that judges exercise policy discretion brings tremendous unease to patent lawyers, as the seeming consequence

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[188] *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 607 (1950).

[189] *See* Amy Cohen, *Copyright Law and the Myth of Objectivity: The Idea-Expression Dichotomy and the Inevitability of Artistic Value Judgments*, 66 Ind. L.J. 175 (1990) (arguing that copyright law lacks any objective basis to determine the proper level of abstraction, and artistic value judgments are inevitable); *cf.* Zechariah Chafee, Jr., *Reflections on the Law of Copyright*, 45 Colum. L. Rev. 503, 523 (1945) (describing the copying of "patterns" similar to levels of abstraction).

[190] *See* Burk & Lemley, *supra* at note 12, at 53-54 (arguing that claim language is necessarily indeterminate and for greater reliance on the doctrine of equivalents).

[191] Jane C. Ginsburg, *No "Sweat"? Copyright and Other Protection of Works of Information After Feist v. Rural Telephone*, 92 Colum. L. Rev. 338, 346 (1992).

[192] *Herbert Rosenthal Jewelry Corp. v. Kalpakian*, 446 F.2d 738, 742 (9th Cir. 1971).

[193] Alan L. Durham, *Copyright and Information Theory: Toward an Alternative Model of "Authorship"*, 2004 B.Y.U. L. Rev. 69, 96.

appears to be that the reward for innovation becomes a matter of judicial whim.[194] To this there are two answers. First, the policy inquiry is unavoidable: every invention lies on a spectrum of abstractions, and the rules on which level of abstraction to protect are so self-contradictory that they are practically non-existent.[195] Second, legal discretion—the lack of rigid rules that determine outcomes—need not imply *unprincipled* discretion. Rather, if courts exercise discretion to achieve a common goal within a shared normative framework, predictability can be achieved.[196]

For example, if every judge used his discretion to grant the patent scope that maximized research investment dollars, then the question simply becomes an empirical one: what degree of patent scope maximizes research investment dollars?[197] The outcome of cases can then be predicted by doing the empirical math, with more accuracy than following the formalist and oftentimes contradictory rhetoric of judicial opinions.[198] Of course, answering complex inquiries such as the optimal patent scope is difficult.[199] But difficult and costly are not the same as unprincipled or indeterminate. Judicial consideration of policy is not the same as judicial whim.

B. Considerations in the Policy Balance

Once it is acknowledged that judges must exercise substantial discretion in determining patent scope, the question becomes how that discretion should be exercised. The difficulty here is that patent scope

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[194] *SRI Int'l v. Matsushita Elec. Corp. of Am.*, 775 F.2d 1107, 1118 (Fed. Cir. 1985) (*en banc*).

[195] *See* Merges & Nelson, *supra* at note 28, at 841 (arguing there is considerable discretion over scope, and economic policy should inform how discretion is exercised).

[196] *See* Pierre J. Schlag, *Rules and Standards*, 33 UCLA L. Rev. 379, 413 (1985) ("[T]he very flexibility of balancing and totality of circumstances tests refers litigants and judges to other stable norms to inform decision making.").

[197] *See* Pierre N. Leval, *Toward a Fair Use Standard*, 103 Harv. L. Rev. 1105, 1135 (1990) (arguing that courts can create greater predictability "by disciplined focus on the utilitarian, public-enriching objectives of copyright").

[198] *See* Richard A. Posner, *Economic Analysis of Law* § 2.2, at 25 (7th ed. 2007) ("[O]ften the true grounds of legal decision are concealed rather than illuminated by the characteristic rhetoric of opinions . . . , legal education consists primarily of teaching students to . . . find those grounds, many of which turn out to have an economic character.").

[199] *See* Louis Kaplow, *Rules Versus Standards: An Economic Analysis*, 42 Duke L.J. 557, 577 (1992) ("Rules cost more to promulgate; standards cost more to enforce."); *see also Nash*, 899 F.2d at 1541 ("Neither Congress nor the courts has the information that would allow it to determine [optimal copyright scope]. Both institutions must muddle through.").

presents a core conflict:[200] Broader patent scope favors an initial invention but hampers subsequent improvement and use.[201] Narrower patent scope favors subsequent improvers and users, but without an initial pioneer there would be nothing upon which to improve and nothing to use. Courts that have policy discretion to select one of many levels of abstraction should refrain from adopting absolutist rules that reach "either extreme of the continuum of generality."[202]

Thus, if we promise the first inventor of a cure for AIDS that he will control all variants of anything that cures AIDS, (*e.g.* whether a radiation machine, a pill, or anything else), the incentive to create that first working embodiment will be very large. But once the first working embodiment is achieved, later improvements are hampered by the monopoly. This can be tremendously costly since those later variants may be cheaper or more effective. If the first working embodiment cures AIDS 50% of the time, do we really want the monopoly to cover a later cure that works 90% of the time? In limiting the scope of Morse's patent on the telegraph, the Supreme Court relied on precisely this concern: "For aught that we now know, some future inventor" may create a better telegraph than what Morse taught. "But yet if it is covered by this patent, the inventor could not use it, nor the public have the benefit of it, without the permission of this patentee."[203]

On the other hand, some degree of control beyond the precise embodiment is necessary for patent incentives to work. If the patentee is confined to precise replication of the first working embodiment, then pirates will quickly learn to copy the principle or the "heart" of the patent without replicating the precise embodiment. With very few exceptions,[204] protection against *only* literal reproduction is worthless

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[200] *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 152 (1989) ("The tension between the desire to freely exploit the full potential of our inventive resources and the need to create an incentive to deploy those resources is constant.").

[201] Merges & Nelson, *supra* at note 28, at 843; *but see* Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & Econ. 265 (1977) (arguing that patents encourage subsequent invention by allowing the first inventor to control later development).

[202] *Nash v. CBS, Inc.*, 899 F.2d 1537, 1540 (7th Cir. 1990).

[203] *O'Reilly v. Morse*, 56 U.S. (15 How.) 62, 113 (1853).

[204] One exception that comes to mind is chemical elements and compounds, where changing even one atom may produce very different results, and so protecting only the embodiment will still confer significant value. *See, e.g.*, *In re Seaborg*, 328 F.2d 996 (C.C.P.A. 1964) (patent on chemical element 95, Americium). But even here this is a matter of abstraction, for a chemical

and easily circumvented. A good historical example is Eli Whitney's invention of the cotton gin—one of the most important discoveries in American history.[205] Due to the narrow scope of patent protection at the time, Whitney received almost no reward for this revolutionary invention, as farmers simply created nearly (but not completely) identical apparatuses.[206] Courts granting broad protection thus frequently cite this necessity of providing sufficient reward to create incentives.[207]

Moreover, not only is protection beyond literal reproduction of the patentee's creation necessary for the patent incentive to work, it can also be socially beneficial. The key here is a difference in timing, in that society gets the first working embodiment *immediately*, while the improvements that are hampered occur only in the future. And without the first working embodiment as a guide, the improvements might never even exist at all, or at least would be delayed even further absent the patentee's pioneering efforts. Allowing the Wright Brother's barely working glider to morph into a monopoly covering the F-117 jet would not be bad, if without the Wright Brother's glider we would not have the F-117 jet. Allowing the first person who develops a 50% effective cure for a raging pandemic to obtain a monopoly that covers a later 90% effective cure is not bad, if without the 50% cure the human race would be extinct before the 90% effective is discovered. Under such assumptions, the only thing "'monopolized' and sold at too low quantities is a product that would be sold in even lower quantity—zero—if there were no 'monopoly'" in the first place.[208]

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element will have numerous isotopes. Does the first creator of one isotope get to control every later isotope?

[205] It is worth emphasizing that no inventor creates an "invention" whole, and what the inventor created depends on the level of abstraction at which it is described. See text accompanying note 211, *infra*. Thus, it is equally accurate to say that Eli Whitney created only *one particular* cotton gin. Angela Lakwete, *Inventing the Cotton Gin: Machine and Myth in Antebellum America* viii (2003) (arguing that "Eli Whitney patented not the first but a new type of gin").

[206] National Archives, *Eli Whitney's Patent for the Cotton Gin*, available online at http://www.archives.gov/education/lessons/cotton-gin-patent/ (last visited July 6, 2009).

[207] *See, e.g.*, *Graver Tank*, 339 U.S. at 607 ("courts have also recognized that to permit imitation of a patented invention which does not copy every literal detail would be to convert the protection of the patent grant into a hollow and useless thing"); *Invitrogen Corp. v. Clontech Labs., Inc.*, 429 F.3d 1052, 1071 (Fed. Cir. 2005).

[208] John W. Schlicher, *Patent Law: Legal and Economic Principles* § 5:36 (2d ed. 2006).

Between these two competing goals of providing incentives and not hampering subsequent improvement and use, there is an optimal point of abstraction and scope that maximizes economic welfare. Of course, this optimal point is very difficult to discern and will likely vary by industry or even individual patent.[209] My goal in this Article is not to articulate a rule that reaches the right answer. Rather, my more modest aim is simply to note that courts are much more likely to reach the right answer if they confront the question openly, and allow litigants to supply them with the information that helps to address the question. Formalistic adherence to textual meaning and specification disclosures do not help address the question of how far scope should extend beyond the embodiments taught by the specification. Neither dictionaries nor specifications will contain an answer to that question. What will help in providing an answer is an assessment of the social benefits of the pioneer's first working embodiment; the incentives necessary to achieve this breakthrough; the cost of monopoly in terms of what later research has been or will be hampered; and the extent to which subsequent research is dependant upon the pioneer's ideas and discoveries (and the patent incentives that facilitated the pioneer's efforts). These are but some of the factors that the economic literature on optimal patent scope would invite a court to consider.[210]

Reaching policy *balance* is especially essential because no patentee is either purely a pioneer or purely an improver. Every patentee is a mix of both. Thomas Edison did not invent the first incandescent lamp, he improved upon prior lamps such as that of Sawyer and Man.[211] At the same time, every patentee that creates something "new, useful, and non-obvious" by definition pioneers something—whatever it is that is considered non-obvious compared to the prior public domain. In this way again, everything in patent law depends on abstraction. Every patentee is only marginally improving the world at a high level of abstraction, while pioneering in his own narrow specialty: Edison merely improved upon prior methods of lighting (high abstraction), but he did so by pioneering the use of carbonized bamboo as filament (low

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[209] *See* Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 Va. L. Rev. 1575, 1615 (2003) (arguing that optimal rules will vary by industry).

[210] *See generally* Kitch, *supra* at note 201, at 285-86 (arguing for broader patents to pioneers that allow them to direct subsequent development in an orderly manner); Merges & Nelson, *supra* at note 10, at 198-99 (arguing for narrower scope since "[w]ide patent scope that exceeds the enablement of the disclosure makes anyone who attempts to invent in that area beholden to the patent owner."); Paul Klemperer, *How Broad Should the Scope of Patent Protection Be?*, 21 RAND J. Econ. 113 (1990); Richard Gilbert & Carl Shapiro, *Optimal Patent Length and Breadth*, 21 RAND J. Econ. 106 (1990).

[211] *The Incandescent Lamp Patent*, 159 U.S. 465 (1895)

abstraction). A rule that tended toward either extreme—one that either snuffed out the incentives to pioneer or strangled improvement—would equally impede innovation within the patent system, since every patentee is a combination of both.[212]

If the policy oriented inquiry appears to daunting, it is worth reminding ourselves that the inquiry has been done in the copyright context since Learned Hand articulated the problem in 1930. There remains no bright-line rule on what level of abstraction copyright law will protect. But the abstractions test does provide an enormously useful framework, which reminds judges of "the difficulties that require courts to avoid either extreme of the continuum of generality."[213] Because every copyright court understands that scope lies on a spectrum of abstractions, and the problems created by going to either extreme (either destroying incentives or crippling improvement), copyright has refrained from absolutist rules such as confining scope to literal reproduction of the IP owner's creation (as the full scope rule effectively does);[214] or the opposite extreme of permitting unlimited abstraction (as the one-embodiment-enables-everything rule does).[215] Honestly acknowledging that rules do not work and a standard applies is better than pronouncing self-contradictory rules that serve only to confuse.

Moreover, standards are far more determinate in intellectual property law than other areas,[216] because there is widespread consensus on the normative framework—economics-based utilitarianism.[217] This means that disagreement about patent

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[212] Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 79 Tex. L. Rev. 989, 996-97 (1997).

[213] *Nash*, 899 F.2d at 1540.

[214] See text accompanying notes 92–104, *supra*.

[215] See text accompanying notes 106–109, *supra*.

[216] For example, one persistent problem in criminal law is disagreement about the underlying normative goals: is the goal of criminal law to deter, to punish, or to rehabilitate? Even with perfect information, judges will disagree about the optimal sentence, because they are seeking to achieve different normative ends. *See* George P. Fletcher, *The Nature and Function of Criminal Theory*, 88 Cal. L. Rev. 687, 689 (2000) ("The field of criminal theory should be thought of more as a humanist inquiry than as a social science. The questions that concern us are not empirical.").

[217] F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 Minn. L. Rev. 697, 697-98 (2001); Yochai Benkler, *Siren Songs and Amish Children: Autonomy, Information, and Law*, 76 N.Y.U. L. Rev. 23, 59 (2001); *see Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 480-81 (1974) ("The stated objective of the Constitution . . . is to 'promote the Progress of Science and useful Arts.' The patent laws . . . have a positive effect on society . . . by way of increased employment and better lives for our

outcomes is largely *empirical*. Almost everyone agrees that we should grant a patent only if doing so increases social welfare, defined in economic terms.[218] The disagreement is simply about whether granting or expanding a particular patent has that desirable effect, which arises because judges do not have accurate information on the effects of greater scope.[219] The way to cure this disagreement is simply to collect the necessary empirical information. In the absence of relevant information, judges must speculate about the net economic effects of increased scope, and naturally their intuitions will differ.[220] With sufficient information, such empirical disagreements can be resolved.[221]

In the end, it may well be that collecting the necessary information to reach a conclusion about optimal patent scope is too costly or simply impossible. But even if that is so, a transparent analysis using the information that is available will still likely create better normative results, with greater predictability, than current formalist doctrine.

C. Workability and Doctrinal Implementation

Practical implementation of the levels of abstraction framework requires fitting the framework into current doctrine. In one sense, of course, it already exists in current doctrine: judges of necessity decide the level of abstraction during infringement trials, usually through claim construction or enablement, by determining whether the scope of a valid claim includes the accused product.[222] But the analysis can be improved by explicitly considering the policy effects of granting broader or narrower scope to a patent. The question is whether this policy analysis is better done through the rubric of (1) construing patentee claims, (2) freestanding judicial scope determination; or (3)

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citizens."); *Graham v. John Deere Co.*, 383 U.S. 1, 5-6 (1966) ("Congress in its exercise of the patent power may not . . . enlarge the patent monopoly without regard to the innovation, advancement or social benefit gained thereby.").

[218] *See* Tun-Jen Chiang, *A Cost-Benefit Approach to Patent Obviousness*, 82 St. John's L. Rev. 39 (2007) (arguing for utilitarian approach to patentability); A. Samuel Oddi, *Beyond Obviousness: Invention Protection in the Twenty-First Century*, 38 Am. U. L. Rev. 1097, 1101 (1989) ("a patent system produces a net benefit to society provided patents are granted only for those inventions induced by the patent system").

[219] *Nash*, 899 F.2d at 1341 ("Neither Congress nor the courts has the information that would allow it to determine [how much scope] is best.").

[220] *See* Ginsburg, *supra* at note 191, at 346.

[221] Chiang, *supra* at note 218, at 75-76 (making the same point in the context of obviousness doctrine).

[222] *See* Burk & Lemley, *supra* at note 12, at 50

invalidating overbroad claims. Each of these possibilities will be considered in turn.

1. Claim construction as a policy vehicle.

As a practical matter, the current law determines scope during claim construction. After a claim is construed, the overwhelming majority of cases settle or are resolved on summary judgment of infringement or non-infringement.[223] Descriptively speaking, current claim construction doctrine is often manipulated to achieve the court's desired scope.[224] The normative question is whether such results-oriented construction is desirable.[225]

Using claim construction as a policy vehicle is quite simple. If broader scope is socially desirable, the court will grant a high level of abstraction; and if narrower scope is socially optimal, the court will import limitations from the specification to narrow the claim down. Indeed, the Supreme Court has previously endorsed this type of policy-oriented (*i.e.* results-oriented) claim construction:

> In administering the patent law, the court first looks into the art to find what the real merit of the alleged discovery or invention is and whether it has advanced the art substantially. If it has done so, then the court is liberal in its construction of the patent, to secure to the inventor the reward he deserves. If what he has done works only a slight step forward, and that which he says is a discovery is on the borderline between mere mechanical change and real invention, then his patent, if sustained, will be given a narrow scope, and infringement will be found only in approximate copies of the new device.[226]

The problem with this approach is that, at the end of the day, claim *construction* is always going to be anchored by formalism and claim

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[223] Lemley, *supra* at note 151, at 102; *see Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 989 (Fed. Cir. 1995) (*en banc*) (Mayer, J., concurring) ("to decide what the claims mean is nearly always to decide the case").

[224] See text accompanying 159–161.

[225] *See* Cotropia, *supra* at note 157, at 127-33 (arguing that claim construction is an effective policy lever).

[226] *Eibel Process Co. v. Minnesota & Ontario Paper Co.*, 261 U.S. 45, 63 (1923). Of course, this type of results-oriented claim construction methodology is strongly disfavored in the current Federal Circuit. *See* Merges & Duffy, *supra* at note 23, at 802-03.

language.[227] If the patentee has written an overly-narrow claim (admittedly very rare), there is only so much the court can do to expand it. Similarly, a patentee who mimics Samuel Morse and writes insistent language into a broad claim—*e.g.* "I do not propose to limit myself to the specific machinery or parts"—will make it difficult for a court to narrow the claim down through interpretation.[228] As the Court in *Morse* discovered, frequently a hard limit on claim scope—divorced from claim language drafted by the patentee—is needed.

Of course, a court could simply construe claims broadly or narrowly, by fiat, notwithstanding whatever the claim language says. But a court that simply disregards the claim language ceases to do anything reasonably called "construction"; it *de facto* adopts a freestanding scope doctrine where judges determine scope in the first instance. Where patent scope is simply a matter of judicial pronouncement, claim language becomes irrelevant and unnecessary to even have at all. This is undesirable because, as the next section discusses, claim language serves important notice and definition functions.[229] Thus, giving effect to formal claim language remains important. And if giving effect to formal claim language is important, other policy considerations are necessarily undermined. Claim construction is thus not a good vehicle for economic policy and balancing.[230]

2. Freestanding scope determination.

An alternative to being anchored by formal claim language is to simply disregard it. Courts could simply determine patent scope in the first instance, according to the dictates of economic policy. This means courts would simply pronounce the scope of a patent, without invalidating claims but also without giving them any effect, and thus rendering claims basically irrelevant.

A regime of disregarding claims is almost inconceivable in modern patent law, where the importance of written claims is routinely emphasized.[231] It is, however, not as radical as one might think. Such

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[227] *See* Adrian Vermeule, *Interpretative Choice*, 75 N.Y.U. L. Rev. 74, 128-29 (2000) (arguing that interpretative doctrines should tend toward formalism).

[228] See text accompanying notes 73–75, *supra*.

[229] See text accompanying notes 239–249, *infra*.

[230] See text accompanying notes 250–251, *infra*.

[231] *In re Hiniker Co.*, 150 F.3d 1362, 1369 (Fed. Cir. 1998) ("the name of the game is the claim."); John F. Duffy, *On Improving the Legal Process of Claim Interpretation: Administrative Alternatives*, 2 Wash. U. J.L. & Pol'y 109, 109 (2000) ("Claims are the most important part of the modern patent document."); Paul M. Janicke, *When Patents Are Broadened Midstream: A*

a regime in fact describes copyright law, where courts determine the scope of a copyright through the Hand abstraction framework, without anything resembling claims. And it describes American patent law prior to 1809, before which patents did not have claims.[232]

Before claims existed, courts determined patent infringement by comparing the specification embodiment to the accused product, and asking whether the two were "substantially, in their principles and mode of operation, like."[233] It can be immediately recognized that, in determining whether the two products shared a common "principle," the answer depends entirely on the level of abstraction at which the principle is considered by a court.[234] Pretty much everything shares a "principle" or "idea" at some level of abstraction—everything is made of atoms and operates under the principles of physics. By determining the governing "principle" of a patent, courts determined the level of abstraction and patent scope. This early experience of American patent law shows that it is entirely feasible for courts to pronounce patent scope without reference to patentee-drafted claims. Indeed, modern patent law still technically allows courts to make such freestanding determinations of scope: through the doctrine of equivalents (which allows courts to grant broader scope than the claim language),[235] and the reverse doctrine of equivalents (which allows courts to narrow of scope notwithstanding any literal claim language).[236] The essential question in the equivalence inquiry remains whether the elements of two products are "insubstantially different,"[237] with the answer largely depending on the level of abstraction at which the similarities and differences are compared.[238]

Compromise Solution to Protect Competitors and Existing Users, 66 U. Cinn. L. Rev. 7, 16 (1997) ("entirety of patent law centers around" claims).

[232] *See* William Redin Woodward, *Definiteness and Particularity in Patent Claims*, 46 Mich. L. Rev. 755, 758 (1948) (tracing the first patent claims to Robert Fulton's patent on the steamboat).

[233] *Odiorne v Winkley*, 18 Fed. Cas. 581, 582 (C.C.D. Mass. 1814).

[234] See text accompanying notes 182–187.

[235] This freestanding discretion has been cabined somewhat after *Warner-Jenkinson Co. v. Hilton Davis Chemical Co.*, 520 U.S. 17 (1997), which required analysis of substantial similarity to follow the *structure* of a claim, even if not its literal language. *Id.* at 29.

[236] *Westinghouse v. Boyden Power Brake Co.*, 170 U.S. 537, 569 (1898) (describing the reverse doctrine of equivalents).

[237] *Warner-Jenkinson*, 520 U.S. at 39-40.

[238] *See* Adelman *et al.*, *supra* at note 11, at 806 (giving the example of comparing two forks, with equivalence depending on whether you compare them at the level of individual tines or as generic forks).

As much as history and experience show it is *possible* to not have claims and relying on a freestanding judicial pronouncements of scope, history and experience also show that such a regime is unwise.[239] The experience of history has led to claims predominating today,[240] with both the doctrine of equivalents and the reverse doctrine of equivalents being largely moribund.[241] One frequently cited benefit of defining scope through claims is the unpredictability of the "substantial similarity" test;[242] though given the uncertainty of claim construction doctrine this benefit is questionable.[243] A far more important reason for requiring claims, however, is the patentee's comparative information advantage at the time of patent filing.[244] A patentee, far more than any other participant in the patent system, is likely to know which features of his embodiment are novel, and which are not, and what he regarded as important to his own incentives when filing for the patent.[245] Thus, even if claims are drafted at a very high level of generality, they at least force the patentee to disclose this knowledge by disclaiming what is old and previously in the public domain.[246] For example, a patentee who creates a radiation machine to cure AIDS might claim very broadly, such as claiming "a cure for AIDS," but the claim would be carefully drafted to exclude curing cancer using radiation, since that is already in the public domain and the patentee

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[239] *See generally* John F. Duffy, *The* Festo *Decision and the Return of the Supreme Court to the Bar of Patents*, 2002 Sup. Ct. Rev. 273, 309-10 (describing the emergence of claims to address problems created by the substantial similarity test).

[240] *Merrill v. Yeomans*, 94 U.S. 568, 570 (1877) (formal claims are "of primary importance in the effort to ascertain precisely what it is that is patented").

[241] *Roche Palo Alto LLC v. Apotex, Inc.*, 531 F.3d 1372, 1377 (Fed. Cir. 2008) ("The reverse doctrine of equivalents is rarely applied, and this court has never affirmed a finding of non-infringement under the reverse doctrine of equivalents."); John R. Allison & Mark A. Lemley, *The (Unnoticed) Demise of the Doctrine of Equivalents*, 59 Stan. L. Rev. 955 (2007) (arguing that, as a practical matter, the doctrine of equivalents is largely dead).

[242] *See* Joshua D. Sarnoff, *Abolishing the Doctrine of Equivalents and Claiming the Future After Festo*, 19 Berkeley Tech. L.J. 1157, 1198 (2004) (arguing that the doctrine of equivalents causes uncertainty and additional litigation costs).

[243] See Part I.B.

[244] Chiang, *supra* at note 68.

[245] *Kintner v. Atlantic Communication Co.*, 240 F. 716, 717 (2d Cir. 1917) ('the patentee is conclusively presumed to have known what he invented or discovered, better than did any one else, at the time he applied for a patent").

[246] *Evans v. Eaton*, 20 U.S. (7 Wheat.) 356, 435 (1822) (patentee ought to "describe what his own improvement is, and to limit his patent to such improvement").

knows this.[247] Patentee-drafted claims thus have an "information-forcing" function that is lost in a freestanding abstraction doctrine. In the absence of claims, courts must independently search for all previously known devices and methods, and exclude them from the patent's scope.[248] Such prior art searches are extremely expensive, and even then often incomplete.[249]

3. Invalidity doctrine as the vehicle for the policy.

The sum of the prior analysis is that having patentee drafted claims is a good thing, and this also implies that claim construction should primarily give effect to the patentee's intent, *without* varying claims to achieve policy goals as is currently done.[250] This does not mean that courts will never consider policy. Rather, the time to do so is after the claim has been formalistically construed. By formalistically following patentee intent during claim construction no matter how broad—determining exactly what monopoly the patentee *seeks*—courts can then use invalidity or rejection to control whether the patentee should *get* it as a policy matter. The hard limit of invalidity, which has no patentee-set anchor like claim language, is a much better vehicle for implementing judicial policy than claim construction doctrine.[251] At

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[247] I have chosen an example of prior art that is widely known. *See* Jay H. Stein, *Internal Medicine* 553 (5th ed. 1998). But the point is that there are many old devices that a patentee versed in the field would know about, but a lay judges would not; and patentees would carefully draft their claims to exclude such prior art.

[248] To be sure, the PTO will conduct a search anyway. 37 C.F.R. § 1.104 (2009). But the patentee's claims serve as the starting point for a PTO search, and thus having claims saves the PTO some search costs. *See* United States Patent and Trademark Office, *Manual of Patent Examining Procedure* § 904.01 (8th ed. 2001) ("The breadth of the claims in the application should always be carefully noted" in conducting a search.).

[249] *Keystone Bridge Co. v. Phoenix Iron Co.*, 95 U.S. 274, 278 (1877) (claims "reliev[ed] the courts from the duty of ascertaining the exact invention of the patentee by inference and conjecture, derived from a laborious examination of previous inventions, and a comparison thereof with that claimed by him").

[250] See text accompanying notes 159–161.

[251] One implication is that courts should stop placing a thumb on the scales against finding invalidity, as they do now. *See* Douglas Lichtman & Mark A. Lemley, *Rethinking Patent Law's Presumption of Validity*, 60 Stan. L. Rev. 45 (2007). This judicial bias against invalidating overbroad claims—which really has no good justification—distorts incentives and leads litigants and courts to prefer narrowing claims through interpretation (even if dishonest, implausible, or twisted) than outright invalidation. *See* Roger Shang & Yar Chaikovsky, *Inter Partes Reexamination of Patents: An Empirical Evaluation*, 15 Tex. Intell. Prop. L.J. 1, 25 (2006) ("In almost every patent litigation, the defendant must choose between two competing strategies: arguing for a

the same time, by requiring the patentee to make an initial claim to scope, on pain of forfeiting anything not claimed,[252] courts retain the benefit of the information-forcing function of claims.

Once courts determine what a claim is intended to cover, and if they find it is overbroad under an economic policy-based abstraction analysis, the precise label used to strike the claim down matters little, as long as everyone understands the real test being applied. The rejection may be classified under doctrines of patent eligibility,[253] or enablement,[254] or written description,[255] or proper claiming.[256] What must be remembered is that the economics-based abstraction inquiry is distinct from the other functions of these established doctrines.

Enablement, for example, can be a label used to strike down claims that are overbroad from an economic point of view, and is in fact often so used.[257] But it currently serves a distinct and essential function of determining what embodiments the patentee *has* taught,[258] and ensuring that at least one working embodiment is among them. This "one working embodiment" aspect of enablement doctrine does not depend on abstraction, and it is not plagued by conflicting case law: it in fact works quite well.[259] In contrast, the economics-based abstraction inquiry is how far *beyond* the taught embodiments patent

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narrow claim interpretation to avoid infringement, or arguing for a broad claim interpretation to invalidate the patent. . . . Seasoned patent litigators almost always prefer to focus on the noninfringement argument.").

[252] *Johnson & Johnston Assocs., Inc. v. R.E. Serv. Co.*, 285 F.3d 1046, 1054 (Fed. Cir. 2002) (*en banc*) (unclaimed subject-matter is dedicated to the public).

[253] *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972); *Burr v. Duryee*, 68 U.S. (1 Wall.) 531, 570 (1863).

[254] *In re Hyatt*, 708 F.2d 712, 714 (Fed. Cir. 1983).

[255] *LizardTech, Inc. v. Earth Resource Mapping, Inc.*, 424 F.3d 1336, 1345 (Fed. Cir. 2005).

[256] *Intervet America, Inc. v. Kee-Vet Labs., Inc.*, 887 F.2d 1050, 1053 (Fed. Cir. 1989) ("Ambiguity, undue breadth, vagueness, and triviality are matters which go to claim validity for failure to comply with 35 U.S.C. § 112-¶ 2."); *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1349 (Fed. Cir. 2002) (setting forth an "honest claiming" requirement).

[257] *See, e.g.*, *The Incandescent Lamp Patent*, 159 U.S. 465, 476 (1895) ("to exclude everybody from the whole domain of fibrous and textile materials, and thereby shut out any further efforts to discover a better specimen of that class than the patentee had employed, would be an unwarranted extension of his monopoly and operate rather to discourage than to promote invention").

[258] Again, what the patentee has taught includes both the embodiments taught explicitly, and those constructively disclosed by supplementing the specification with ordinary skill known at the time of filing.

[259] See text accompanying note 173.

protection should extend, and the "undue experimentation" test does not answer this inquiry.[260] Framing both inquiries under the rubric of "enablement" is prone to causing confusion. The danger is that courts will mesh the two purposes together and develop a single absolutist test, repeating the fallacy of the unitary invention principle.

Likewise, the written description doctrine, in addition to its function of policing scope, has a separate and important timing function.[261] This timing function is to help ensure that the currently claimed scope was intended by the patentee *at the time of filing*, a necessity because patentees can amend claims *ex post*.[262] In other words, the written description requirement serves an important function of ensuring that the patentee does not *retroactively* expand the scope of his patent; because regardless of whether that expanded scope is justified from a weighing of incentives versus monopoly cost, its retroactivity causes independent problems of notice.[263] The possible confusion of these two distinct purposes and modes of analysis (preventing retroactivity versus preventing excessive monopoly scope) must be avoided, either by constantly reminding courts of the difference while still calling both a "written description problem," or more simply by giving them different labels.

The most preferable course would be to avoid shoehorning the problem of undue breadth into any of the established headings of invalidity (*i.e.* unpatentable subject-matter, enablement, written description, and failure to claim), with their preexisting doctrinal baggage.[264] Rather, undue abstraction may be identified as its own

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[260] See text accompanying notes 176–178.

[261] Janice C. Mueller, *The Evolving Application of the Written Description Requirement to Biotechnological Inventions*, 13 Berkeley Tech. L.J. 615, 620-23 (1998) (describing the operation of written description to prevent retroactive changes).

[262] *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1560 (Fed. Cir. 1991) ("the 'written description' requirement most often comes into play where claims not presented in the application when filed are presented thereafter").

[263] Chiang, *supra* at note 68; Robert P. Merges, *Software and Patent Scope*, 85 Tex. L. Rev. 1627, 1653-54 (2007) (describing the problem of "misappropriation by amendment").

[264] In addition the problems with the enablement and written description doctrines, the other doctrines have their own baggage. Patentable subject-matter tests exclude products of nature and other prohibited categories, regardless of abstraction. *Funk Brothers Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127 (1948). Thus, a single specific moon rock is not patentable, even though it is not abstract. Failure to claim under 35 U.S.C. § 112 ¶ 2 is primarily directed to insolubly vague claims, such as claims to "aesthetically pleasing" objects. *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342,

ground of invalidity, with an economically oriented analysis that is distinct from current doctrine.

This is not to say that the considerations that inform the current doctrines of enablement and written description are utterly irrelevant to the economic analysis. Rather, a separate doctrine is desirable precisely because the enablement test somewhat captures the problem, but misses many critical distinctions, and causes enormous confusion. For example, the current enablement test collapses the inquiry of what the patentee *has* taught with the inquiry of what additional scope should be afforded, using a single criterion of "undue experimentation." As mentioned before, "undue experimentation" is useful to determine what the patentee has taught, because all predictable variants at the time of filing are considered constructively taught by the specification. The concept of predictable experimentation is also relevant to the economic balancing of the abstractions test, but in a very different way. Predictability is useful to economic balancing because the investment incentives of pioneers and subsequent improvers are both affected by the predictability of a field. Given a pioneering table, it is easy to quickly create a large range of improved tables because the principles of physics in this area are well-established; while given a pioneering cure for AIDS, it is difficult to create a large range of improved cures because the principles of medicine are complex. The improver of an improved table has made only a small contribution over the pioneer; the improver of a cure for AIDS a large one. Thus, predictability is a relevant consideration in determining both what the specification *has* constructively enabled; and what additional, non-enabled, embodiments should be covered by the patent.

But just as the example demonstrates that predictability is relevant to the economic balancing test, it also illustrates critical distinctions that are prone to becoming lost in the rhetoric of a single "enablement" doctrine. In determining what embodiments the specification *has* taught, predictability provides a straightforward lodestar: if a variant is predictable at the time of filing, it is constructively disclosed; and the more predictable a field is, the more variants are constructively disclosed. [265] In contrast, in determining what non-taught embodiments should be covered to protect economic incentives, predictability is one ambiguous factor in a complicated calculus. First, the non-taught embodiments will often arise only *after* filing, when

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1356. (Fed. Cir. 2005). Vagueness and undue abstraction are distinct problems, and should not be confused. See text accompanying notes 152–154.

[265] *See In re Cook*, 439 F.2d 730, 734 (C.C.P.A. 1971) (creating "a dichotomy between predictable and unpredictable factors in any art" in analyzing enablement).

new technology (such as improved materials) becomes available, and thus predictability must be assessed at different times. Second, predictability can often cut both ways. Medicine and biotechnology is generally less predictable than mechanical fields such as tables;[266] suggesting that the scope of pioneering patents should be narrower in medicine and biotechnology since the contribution of later improvers is greater.[267] But the lack of predictability in medicine and biotechnology also means the necessity of patent incentives for pioneers is greater, too. It takes more investment to create a first cure for AIDS than it does to create a new table. Thus, lack of predictability can be invoked to support greater or narrower scope, depending on the circumstances. A separate doctrine divorced from enablement will clarify how economic factors should affect patent scope, and will force courts to more directly confront the levels of abstraction problem. A more explicitly economic analysis will also bring greater transparency to this area and increase its predictable application.

CONCLUSION

The "invention" is the fundamental concept of patent law, but it actually comprises two distinct concepts. On the one hand, the invention refers to an embodiment created by the patentee; and a new, useful and non-obvious embodiment is required for patentability. On the other hand, the invention refers to an idea that exists within the embodiment; and the patent monopoly extends to the full scope of that idea, even when embodied in other machines or processes.

The duality in the concept of invention requires extracting an idea from an embodiment when defining patent scope. Because each embodiment contains many ideas, there is no inherently correct level of abstraction to define the idea that should be covered by the patent. Reflecting this difficulty is the fact that that nearly every patent case involves a tug-of-war between a patentee's claim to a broader level of abstraction to promote incentives, and limiting the patentee to the specific embodiment that he created to reduce the monopoly cost of a patent. Because the specific embodiment is considered to be "the invention" as much as the claimed idea, this tug-of-war has no intuitive resolution. Instead, what has developed is contradictory doctrine that simultaneously requires the "invention" to be defined to the specification embodiment *and* absolutely forbids such importation of limitations from the specification.

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[266] *See* Sean B. Seymore, *Heightened Enablement in the Unpredictable Arts*, 56 UCLA L. Rev. 127, 136-38 (2008) (contrasting "electrical and mechanical engineering" with the "experimental sciences").

[267] *See id.* at 156 (arguing for a higher enablement requirement and thus narrower patents in unpredictable fields).

Once we understand that every invention can be characterized as multiple ideas on many levels of abstraction, it becomes clear that what is needed is a careful balancing of competing interests. The current absolutist rules fail because they either define the invention by the specification and destroy patent incentives by reducing scope to nothingness; or they allow patentees to draft broad claims that have essentially no limit to monopoly cost. The conflict between the rules creates unpredictability; but rigidly enforcing only one rule or the other would be equally bad, because they create unacceptable policy consequences. Rather, the best way to achieve accuracy and predictability in selecting a level of abstraction for patent scope is to make the process more transparent, increase the amount of available information, and balance the competing interests under a policy-oriented standard. Such transparency will create greater predictability and more normatively desirable results than the current self-contradictory rules.

The most important point in this Article remains that the levels of abstraction problem is *inherent* in patent infringement disputes. Courts must determine whether an accused product falls within the valid scope of a patent, and thus they must, at some point, determine the protected level of abstraction. Even courts that honestly believe that an invention is a unitary concept between the specification and the claims ultimately resolve the abstraction problem: they just do so silently, arbitrarily, and unpredictably. By presenting the levels of abstraction problem in a more stark way, my goal is to facilitate a more explicit analysis of the underlying policy considerations in delineating appropriate patent scope. Further research is needed to determine how the competing interests of providing sufficient rewards through greater scope, and facilitating improvement by narrower scope, should be optimally balanced, and the doctrinal mechanisms by which such a balance can be implemented.