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The Reach of Literal Claim Scope into After-Arising Technology: On Thing Construction and the Meaning of Meaning

Kevin Emerson Collins
Indiana University Maurer School of Law

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The Reach of Literal Claim Scope into After-Arising Technology: On Thing Construction and the Meaning of Meaning

KEVIN EMERSON COLLINS

Broadly speaking, courts and commentators have offered two theories to explain the relationship between the literal scope of a patent claim and after-arising technology (AAT), i.e. technology that is not discovered until after a claim has been filed. The fixation theory asserts that claim scope is and/or should be fixed on the date a claim is filed and that this fixation makes it impossible for the claim to encompass AAT because a claim must grow in some sense after the filing date in order to encompass AAT. In stark contrast, the growth theory argues that literal claim scope does and/or should encompass AAT on a routine basis and that literal claim scope therefore cannot be fixed on the date of filing.

Finding neither of these theories satisfying, either descriptively or normatively, this Article rejects them. More specifically, it rejects a logical premise that both theories share, namely that simultaneous fixation of and growth in literal claim scope is a logical impossibility. The concept of the literal scope of a claim is ambiguous in several ways. Courts can—and routinely do—fix one concept on the date of filing to achieve certain goals, such as furthering public notice, while at the same time allowing a distinct concept to grow and absorb AAT to achieve other goals, such as providing sufficient incentives. Every time a court addresses whether AAT falls within the literal scope of a valid patent claim, it necessarily constructs the things claimed by a patent and defines the nature of the meaning that permits the claiming language to describe those things. Literal claim scope can remain fixed and yet literal claim scope can grow to encompass AAT at the same time (in different senses of the concept of literal claim scope, of course) provided that a court makes tactical decisions in the course of constructing things and defining meaning.

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The Reach of Literal Claim Scope into After-Arising Technology: On Thing Construction and the Meaning of Meaning

KEVIN EMERSON COLLINS*

[A] patent system must be related to the world of commerce rather than to the realm of philosophy.¹

I. INTRODUCTION

The literal scope of a patent claim is not limited to the particular things that an inventor actually discloses in detail in her patent application. Rather, contemporary patent claims are peripheral claims. They use descriptive language to mark the outer boundary of a category of inventive things that extends well beyond the specific embodiments of an invention that the inventor discloses. So long as the fictional person having ordinary skill in the art of the invention (the PHOSITA) can make, use and understand the structure of a non-disclosed embodiment at the time the patent application is filed, a claim can describe that non-disclosed embodiment, too. This rule of constructive disclosure is both descriptively uncontroversial and normatively desirable if patents are to create incentives and lure people into inventive and innovative pursuits. Without this rule, either the incentives would be too meager, because competitors could design around patent claims with only trivial investment, or the cost of applying for patent protection and disclosing all conceivable embodiments would be so great that the game (patent protection) would frequently not be worth the candle (the cost of the application).

However, the *terra firma* of the constructive disclosure rule comes to an end when a non-disclosed, allegedly infringing product or method incorporates after-arising technology (AAT)—technology that is not invented until after the filing of a patent application. Here, the alleged infringer is an inventor, too (although she may not be recognized as an

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¹ Brenner v. Manson, 383 U.S. 519, 535 (1966) (quoting *In re Ruschig*, 343 F.2d 965, 970 (C.C.P.A. 1965)).

inventor under the patent laws and she may not seek patent protection). In recent years, judicial and academic attention has been lavished on the question of how far back toward the prior art a patent claim can reach,² but very little attention has been paid to the equally important question of how far beyond the technology constructively disclosed by an inventor and into future technology a claim can reach.

Broadly speaking, there are two competing theories that stake out opposing doctrinal positions on the relationship between literal claim scope and AAT. On the one hand, there is what can be called the *fixation theory*. Both the Court of Appeals for the Federal Circuit (Federal Circuit) and patent commentators regularly argue that literal claim scope is incapable of the post-filing growth that is required to encompass AAT because literal claim scope is fixed on the date of filing. In gross, the argument is that literal claims “cannot capture the later-developed technologies because to do so would require the claims to be interpreted as they are understood at some time after the filing date.”³ In part, advocates of this rule emphasize the better public notice that results from claims whose meanings are fixed at an early date.⁴ In part, advocates of the fixation theory also support their position by arguing that control over AAT is normatively undesirable because it is tantamount to control over something that the patent applicant did not invent. “[T]he applicant must be the ‘inventor’ of the things covered by the patent claims.”⁵ “Because, at the time of the . . . application, . . . [those] skilled in the art [did not know] of the existence of [the allegedly infringing AAT, the AAT] cannot be within the scope of the claims To grant broader coverage would reward [the inventor] for inventions he did not make.”⁶ The doctrine of equivalents unquestionably allows a patentee to reach beyond literal claim scope to control some AAT, but this flexibility has, through rhetorical feedback, only reinforced the reifying effect of the fixation theory as it pertains to literal claim scope: “Without a doctrine of equivalents, any claim drafted in current

² See, e.g., *KSR Int’l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727 (2007) (refining the “teaching, suggestion or motivation” test for nonobviousness).

³ Christopher A. Cotropia, “*After-Arising*” *Technologies and Tailoring Patent Scope*, 61 N.Y.U. ANN. SURV. AM. L. 151, 165 (2005); see also *id.* at 167–68 (“[R]ecent case law has emphasized the temporal limitation on literal claim meaning, prohibiting the literal capture of later-developed technologies.”).

⁴ See Mark A. Lemley, *The Changing Meaning of Patent Claim Terms*, 104 MICH. L. REV. 101, 116 (2005) (arguing in favor of fixing a claim’s meaning on the date of filing because delaying fixation until the date of infringement “would require the scope of patents to change over time” and would mean that “a patent’s scope would not be fixed, but could differ from infringer to infringer as time passes”).

⁵ *Superguide Corp. v. DirecTV Enters. Inc.*, 358 F.3d 870, 898 (Fed. Cir. 2004) (Michel, J., concurring).

⁶ *Schering Corp. v. Amgen Inc.*, 222 F.3d 1347, 1353–54 (Fed. Cir. 2000); see also *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247, 1262 (Fed. Cir. 2004) (Bryson, J., concurring) (stating that valid claims should not “be construed broadly enough to encompass technology that is not developed until later and was not enabled by the original application”).

technological terms could be easily circumvented after the advent of an advance in technology.”⁷

On the other hand, there is what can be called the *growth theory*. The assertion that literal claim scope never expands after filing to encompass AAT is plainly false as a descriptive matter.⁸ A number of high-profile cases expressly sanction the reach of literal claim scope into AAT,⁹ and, yet more troublingly, these cases are only the tip of an iceberg of ongoing, post-filing growth in literal claim scope. The routine phenomenon of blocking patents—successively issued patents that encompass the same technological thing—implies that the scope of a patent claim grows over time to encompass technologies that by definition are not known to the PHOSITA at the time of filing.¹⁰ Given the run-of-the-mill nature of blocking patents, some commentators assume that courts do not actually follow the black letter rule that requires the fixation of claim scope at the time of filing and that courts, instead, fix claim scope only at the time of infringement.¹¹

In terms of their pragmatic effects on the relationship between literal claims and AAT, the two theories are opposites. The fixation theory holds that the ex ante fixation of literal claim scope required for effective public notice renders impossible the growth required for a claim to literally encompass AAT. The growth theory holds that the pervasive ex post growth in literal claim scope required to ensure sufficient incentives or to allow coordinated development of technological prospects renders impossible the ex ante fixation of literal claim scope.

Yet, despite the fact that the theories paint starkly different portraits of patent protection, neither one provides a satisfying descriptive explanation of how the contemporary patent regime actually seems to work. Patent protection finds a middle ground somewhere in between absolute fixation and unbridled growth. One way to explain this middle ground is through judicial oscillation between the theories,¹² but this explanation, too, seems

⁷ *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 234 F.3d 558, 619 (Fed. Cir. 2000) (Rader, J., concurring in part, dissenting in part).

⁸ See Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 267–68 (1977) (noting that the scope of a patent is not commensurate with the scope of the inventor’s discovery and that the “‘hornbook’ rule is very misleading”).

⁹ See, e.g., *infra* text accompanying notes 55–61, 65.

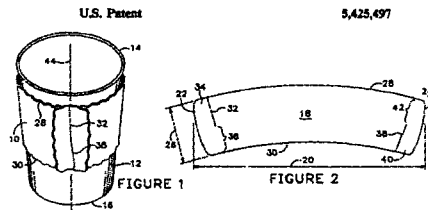
¹⁰ See *infra* notes 66–78 and accompanying text (illustrating the growth in literal claim scope caused by blocking patents).

¹¹ See ROBERT PATRICK MERGES & JOHN FITZGERALD DUFFY, *PATENT LAW AND POLICY: CASES AND MATERIALS* 295–97 (4th ed. 2007) (arguing that “[f]or purposes of infringement, . . . the [claim language] is determined at the time of the alleged infringement”); see also Lemley, *supra* note 4, at 104 (discussing “the well-established principle that the meaning of the claim term for infringement purposes [is] determined as of the time of infringement, not the earlier filing date” but mounting a normative argument against the principle).

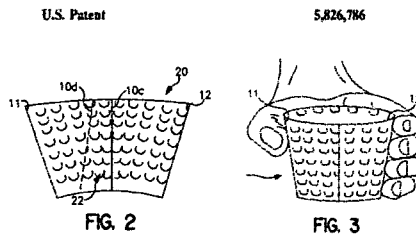
¹² Contemporary patent doctrine has been called a patchwork of “entirely inconsistent visions of the proper footprint of the [literally claimed] invention and how far an inventor can reach toward things

to miss the mark in many cases. The curious puzzle of contemporary patent protection is not that courts alternate between the fixation and growth theories but rather that literal claim scope frequently seems to be both fixed and growing *at the same time*. Claims routinely encompass AAT, yet the growth required to achieve this end undermines neither the stability of literal claim scope at the time of filing nor the capacity of a claim to provide effective public notice.

To illustrate the inadequacy of both the fixation and growth theories, consider a simple hypothetical involving successive inventors in the art of coffee sleeves—the bands of material that slip onto disposable coffee cups and insulate the drinker’s fingers from the heat of the coffee.¹³ An inventor invents the clasping coffee sleeve, a strip of cardboard with interlocking slots:



The inventor claims “an insulating band capable of encircling a disposable cup.” After the inventor files her claim, two subsequent improvers make additional contributions to the art of coffee sleeves. One improver invents and patents a lightweight, insulating plastic, and she fabricates clasping coffee sleeves from it. A second improver invents and patents a nonobvious geometry for the coffee sleeve that allows the strip to be pre-shaped into a circular band and yet stored in a flat configuration that can be easily made annular with one hand:



In these hypotheticals, a court would likely allow our original inventor’s claim to grow to encompass the improvers’ AAT. However, this *ex post* growth does not seem to disrupt or upend the meaning of the claim term “an insulating band” that was fixed at the time of filing.

that come after the invention.” Robin Feldman, *Rethinking Rights in Biospace*, 79 S. CAL. L. REV. 1, 27–28 (2005) (addressing the “footprint” of claims to “biospace” inventions).

¹³ These coffee sleeve hypotheticals are explored at greater length in *infra* Part II.D.

Neither the fixation nor the growth theory adequately explains what happens in easy cases like the coffee sleeve hypotheticals.¹⁴ The choice between the fixation and growth theories demanded by the commentary on the relationship between literal claim scope and AAT seems like a false choice. It seems instead like courts can have their cake and eat it, too. This both-and result is what this Article calls the *fixation-growth paradox* of literal claim scope: literal claim scope can remain fixed at the time of filing, yet it can (and routinely does) grow to encompass AAT nonetheless.¹⁵

When what the extant models suggest should be happening does not map onto what actually appears to be happening, the best approach is often to change models, and that is what this Article argues patent judges and commentators should do. This Article provides a theory that explains the fixation-growth paradox. The theory both saves appearances, describing more accurately than the dominant theories what happens in easy patent cases involving allegations that AAT literally infringes, and provides the tools that courts would need if they were to attempt to further fine-tune the reach of literal claim scope into AAT so as to achieve normative goals.

The fixation and growth theories share a fundamental premise. Both presume that the stabilization of literal claim scope required for effective public notice is logically incompatible with the growth in literal claim scope required for AAT to infringe. They differ only with respect to whether fixation or growth prevails. This Article rejects this premise. It outlines not one, but two mechanisms through which courts can and routinely do resolve the fixation-growth paradox without contradiction so as to enable simultaneous fixation and growth. The mechanisms are deceptively simple. There are several ambiguities in the concept of the literal scope of a claim, and courts can (and routinely do) fix one concept on the date of filing to further public notice while at the same time allowing a distinct concept to grow and absorb AAT. To explain these mechanisms, this Article undertakes a meditation on the nature of a peripheral patent claim and the ambiguities in the concept of literal claim scope that pervade contemporary patent rhetoric.

Part II presents the fixation-growth paradox in greater detail, and it frames the ambivalence-based theories used to explain the paradox pursued in this Article. Because a peripheral patent claim uses descriptive language to mark a set of things, patent lawyers and judges use the term “scope” to invoke two distinct concepts: thing-scope—the size of the set of distinct

¹⁴ *But cf. infra* note 74 (refining the notion of an easy case).

¹⁵ The term is intended as a riff on the “temporal paradox” of enablement and literal infringement put forward by Robert Merges. Robert P. Merges, *Rent Control in the Patent District: Observations on the Grady-Alexander Thesis*, 78 VA. L. REV. 359, 379–80 n.73 (1992). However, Merges’ theory of the temporal paradox is a core example of a growth theory, positing that literal claim scope can grow to encompass AAT only because it is not actually fixed on the date of filing. *See infra* note 65.

types of things that a patent owner may prevent others from making, using or selling—and meaning-scope—the generality of the language used in the text of the claim. Additional drilling reveals further ambiguities nested within both thing-scope and meaning-scope as well. Whether they realize it or not, courts inevitably both construct things and define the meaning of meaning whenever they talk about the reach of literal claim scope into AAT. The choices that courts make in the course of constructing things and defining meanings determine whether the literal scope of a peripheral claim can remain fixed on the date of filing in one sense while expanding after that date to reach into AAT in another sense.

Part III addresses *thing construction*. More specifically, it addresses courts' construction of the distinct thing-types that courts must tally in order to determine thing-scope. Courts have some discretion in selecting the granularity at which thing-types are defined, and how courts exercise this discretion affects the reach of literal claim scope into AAT. When courts construct thing-types coarsely rather than finely, they collapse larger collections or genuses of discernable thing-tokens into a single thing-type. Coarser thing-types, in turn, allow the inclusion of more AAT within the fixed thing-scope of a claim. The property of the AAT that makes it after-arising is more likely to be overlooked, and the AAT is more frequently labeled as belonging to the same thing-type already disclosed in the patent. Drawing from a philosophical literature that grapples with the nature of things, Part III concludes with a rough first pass on the descriptive inquiry into the granularity at which courts actually do construct things.

Part IV addresses the meaning of meaning. Philosophers of language argue that there are two plausible theories for explaining how descriptive language achieves meaning. Roughly stated, denotational meaning, or reference, depends principally on relationships between words and the things in the world for which those words stand, whereas ideational meaning, or sense, depends principally on relationships between words. In everyday, unmediated communication, the difference between these theories of meaning is largely without practical consequence, but the convention of fixing the meaning of a claim on its historical date of filing transforms it into a difference that makes a difference. If courts use denotational meaning in claim construction, they must choose between the fixation and growth theories because the fixation of meaning-scope entails the fixation of thing-scope. However, if courts use ideational meaning, they can anchor the meaning of a claim to the date of filing and still allow the thing-scope of the claim to grow over time to encompass AAT because ideational meaning permits play between thing-scope and meaning-scope. As the previous part did, Part IV also concludes with a roughly hewn descriptive argument, illustrating the different contexts in which courts define the meaning of meaning differently.

Part V offers a brief normative argument about how to move forward

once the import of thing construction and the meaning of meaning has been put openly on the table. Courts should not search for principles that are exogenous to patent policy to justify all of their decisions. Rather, things and meanings should sometimes be viewed as policy levers that courts manipulate to tailor the reach of literal claim scope into AAT.¹⁶ The understanding of how courts manipulate things and meanings presented in this Article therefore provides both conceptual tools that allow courts to identify normatively relevant sub-categories of AAT and instrumental tools that allow courts to sanction the reach of literal claim scope into some, but not all, of those categories. In sum, this Article rejects the stark division between “the realm of philosophy” and “the world of commerce” that has been endorsed by the Supreme Court in patent law.¹⁷ It undertakes an inquiry into the former in order to lay bare the tools that courts can, do and should use to adjust patent doctrine to serve the interests of the latter.

II. THE FIXATION-GROWTH PARADOX

This Part lays out the fixation-growth paradox of literal claim scope in detail and frames the remainder of the Article as a demonstration of how courts resolve the paradox without contradiction by either constructing things or defining meaning.

A. *The Scope of a Peripheral Claim*

Peripheral claims are descriptive texts. They specify the necessary and sufficient criteria for the inclusion of a thing within the set of things that a patentee can exclude others from, *inter alia*, making, using, and selling.¹⁸ Only if the claim language describes (or, in patent lingo, “reads on”¹⁹) a thing does the claim encompass the thing.

Peripheral claims earn their name because they are supposed to give the public notice of the full extent of the claim, right out to its “outer boundar[y].”²⁰ Giving notice to the public of claim scope reduces uncertainty and minimizes the cost of navigating a patent-filled

¹⁶ See generally Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575 (2003) [hereinafter Burk & Lemley, *Policy Levers*] (advocating that courts use economic reasoning to generate industry-specific variation in their application of patent law); Dan L. Burk & Mark A. Lemley, *Is Patent Law Technology-Specific?*, 17 BERKELEY TECH. L.J. 1155 (2002) (same).

¹⁷ See *supra* text accompanying note 1. But cf. *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 731 (2002) (suggesting an approach to the doctrine of equivalents that is attuned to philosophical concerns about language and things in stating that “the nature of language makes it impossible to capture the essence of a thing in a patent application”).

¹⁸ 35 U.S.C. § 271(a) (2006). Patent claims can describe either objects (machines, manufactures and compositions of matters) or events (processes). *Id.* § 101. This Article uses the term “things” loosely to encompass both. Cf. *infra* note 206 (noting that events can be defined in an object-like fashion by describing them in terms of properties of the spatiotemporal regions in which they occur).

¹⁹ *Amhil Enters. v. Wawa, Inc.*, 81 F.3d 1554, 1562 (Fed. Cir. 1996).

²⁰ *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 27 n.4 (1997).

technological landscape.²¹ The way in which peripheral claims perform this public notice function becomes more apparent after considering an alternative technique of marking a patentee's interest: the central claim. In a central claiming regime, a publicized prototype marks the exemplary embodiment of the patentee's interest, and courts determine claim scope on a case-by-case, as-needed basis by querying how similar an allegedly infringing thing is to the prototype. Unlike central claims, peripheral claims are said to mark the metes and bounds of a patent because they facilitate the ex ante identification of the outer limit of the patentee's interest.²²

Two distinct concepts populate the everyday understanding of the literal scope of a peripheral claim among patent lawyers and judges. Peripheral patent claims are at the same time describing language and sets of described things, and this duality carries over into how the concept of claim scope is used in patent rhetoric.²³ Patent lawyers sometimes measure claim scope as a function of the meaning of the claim's descriptive language.²⁴ In fact, courts often use scope in a fashion that makes it synonymous with word meaning. "[T]he full scope of [a term's] ordinary meaning" is, and is nothing more than, the term's ordinary word meaning.²⁵ Here, scope is a quality of language that tracks the generality or specificity of word meaning.²⁶ This concept of the scope of a peripheral

²¹ Potential competitors must choose whether to license patent rights, design around them, use the prior art, or abandon efforts in the technological field altogether. These choices are less costly and less risky when there is clear notice. See *Markman v. Westview Instruments*, 517 U.S. 370, 390 (1996) (noting the public benefit of increased predictability of patent scope).

²² *Motion Picture Patents Co. v. Universal Film Mfg. Co.*, 243 U.S. 502, 510 (1917). *But cf. infra* text accompanying notes 231–33 (noting that this analogy misleadingly reifies literal claim scope).

²³ Claim scope has yet other meanings to other audiences. Economists equate claim scope with market power, and thereby allow claim scope to turn on both the things within claim scope in a patent-lawyerly sense and the things outside of it (in addition to consumer preferences). See generally SUZANNE SCOTCHMER, *INNOVATION AND INCENTIVES* 103–07 (2004) (distinguishing legal and economic conceptions of claim breadth and explaining variations among the economic conceptions). Property law academics may treat the notion of claim scope as pertaining to the scope of exclusive rights that a patent owner has vis-à-vis any given thing described by the claim. See, e.g., JOSEPH WILLIAM SINGER, *PROPERTY LAW: RULES, POLICIES, AND PRACTICES* 420–33 (2d ed. 1997) (discussing issues pertaining to the scope of an easement). The patent lawyerly concept of claim scope is more akin to the concepts of scale and configuration in real-property discourse than to the concept of scope. See Robert C. Ellickson, *Property in Land*, 102 YALE L.J. 1315, 1332–35 (1992) (discussing the efficient scale of property in land in relation to the scale of the activities conducted thereon); Henry E. Smith, *Semicommon Property Rights and Scattering in the Open Fields*, 29 J. LEGAL STUD. 131, 144–61 (2000) (discussing a scattered configuration of property boundaries).

²⁴ See, e.g., *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (en banc) (analyzing the extent to which claim construction is a legal, factual, or mixed issue); R. Polk Wagner & Lee Petherbridge, *Is the Federal Circuit Succeeding? An Empirical Assessment of Judicial Performance*, 152 U. PA. L. REV. 1105, 1111 (2004) (discussing the Federal Circuit's wavering approach in claim construction).

²⁵ *Phillips v. AWH Corp.*, 415 F.3d 1303, 1310 (Fed. Cir. 2005) (en banc).

²⁶ See D. ALAN CRUSE, *MEANING IN LANGUAGE: AN INTRODUCTION TO SEMANTICS AND PRAGMATICS* 50 (2000) (portraying greater generality in meaning as "a more extensive area of quality space").

claim is the claim's *meaning-scope*. Patent lawyers in other instances assume that literal claim scope is not a quality of language but a set-theoretical construct made of distinct, possible things. In other words, scope is "the number of competing products and processes that will infringe the patent."²⁷ This concept is *thing-scope*. Thing-scope measures the size of the set of distinct things described by the claim. The larger the set is, the broader the thing-scope of the claim. Importantly, the inventory of the number of distinct things required to measure thing-scope does not depend on the number of instances of tangible things existing in the actual world at any given time. Thing-scope is unaffected by a patentee's decision to manufacture ten or ten thousand widgets.²⁸ Thing-scope grows only with an increase in the inventory of the distinct thing-types known to fall within the patentee's property interest, not the number of thing-tokens that exist in the actual world.²⁹ Except in the calculation of damages, references to "things" or "sets of things" in patent law invoke types, not tokens.

Meaning-scope and thing-scope are distinct concepts. Meanings and things are, metaphysically speaking, apples and oranges.³⁰ Furthermore, there is no single, correct concept of claim scope. Both meaning-scope and thing-scope are integral to patent practice. At the end of the day, patentees are interested in having exclusive rights to a claim (set of things), not exclusive rights to a claim (language). The latter is closer to what a copyright affords an author than to what a patent grants an inventor. However, the claim (language) is critical because it is the legally codified demarcation of the claim (set of things).

B. *The Black Letter Doctrines of Fixation*

Black letter patent doctrine places restrictions on both meaning-scope and thing-scope that are fixed on or pegged to the date on which a claim is filed. Claim construction requires fixation of meaning-scope, and the disclosure doctrines ensure that thing-scope is commensurate to the

²⁷ Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 839 (1990).

²⁸ *But cf.* PETER D. ROSENBERG, PATENT LAW FUNDAMENTALS 39 (1975) ("A claim is an abstraction and generalization of an indefinitely large number of concrete, physical objects.")

²⁹ The notion that a full inventory of the set of things within thing-scope is possible is misleading in two ways. First, the identity of a thing is malleable. *See infra* Part III (exploring thing construction). Second, the set is likely to be infinite. Even the modulation of a single, scalar property can create an infinite number of distinct things. While claims must be definite and bounded, *see* 35 U.S.C. § 112 para. 2 (2006) (requiring claims to "distinctly point[] out and distinctly claim[] the subject matter which the applicant regards as his invention"), a bounded claim requires only that the PHOSITA can draw a line to distinguish claimed and unclaimed things. It does not limit thing-scope to a finite set. Nonetheless, thing-scope can be relatively larger or smaller even if thing-scope is infinite. *See* PAUL R. HALMOS, NAIVE SET THEORY 93 (1960) (presenting Cantor's Theorem in set theory).

³⁰ *But cf. infra* Part IV.A.1 (explaining that the denotational meaning is a set of possible things).

PHOSITA's understanding of the things disclosed in the specification.

Courts use claim construction to determine the word meaning of claim language.³¹ The more general the word meaning, the larger the set of things the claim describes, and the more valuable the claim is to the patentee.³² The inevitable vagueness and ambiguity in word meaning makes claim construction a highly contentious and often outcome-determinative undertaking.³³ Because a lack of clarity in word meaning undermines the public notice that justifies the peripheral claiming regime to begin with,³⁴ courts have developed two rules to reduce uncertainty in word meaning.

First, courts have anointed the PHOSITA as the official arbiter of word meaning.³⁵ The PHOSITA's ordinary and customary understanding of language is dispositive of meaning-scope. The same word can mean different things to different audiences—a “small gap” likely means something different to a construction engineer than it means to a nanotechnologist—so it is important to know whose understanding is legally controlling.

Second, recognizing that meaning can evolve over time, courts also root the meaning-giving PHOSITA on a specific date in history—the date on which a claim is filed.³⁶ As the Supreme Court noted in the context of statutory interpretation, “[i]t does not follow that when a newly invented or discovered thing is called by some familiar word, which comes nearest to expressing the new idea, that the thing so styled is really the thing formerly meant by the familiar word.”³⁷ A “small gap” may mean something different to a construction engineer on an earlier date when building materials can only be fabricated with a significant margin of error than it does on a later date when fabrication machines work on smaller tolerances.

³¹ See *Phillips v. AWH Corp.*, 415 F.3d 1303, 1311–24 (Fed. Cir. 2005) (en banc) (reviewing the basic principles of claim construction).

³² General claim language can also be problematic for a patentee if it broadens the claim so that it reads on the prior art. See 35 U.S.C. §§ 102, 103 (codifying novelty and nonobviousness). Because this Article focuses on the reach of literal claim scope into AAT which, by definition, is not prior art, it presumes that enlarging claim scope is in the patentee's interest.

³³ Cf. CRUSE, *supra* note 26, at 51–52 (distinguishing ill-definedness—the problem of “designat[ing] a region on a gradable scale”—and laxness—the habitual application of a word “in a loose way”—as two subdimensions of vagueness); *id.* at 108 (noting that ambiguity involves words with two or more “antagonistic readings”).

³⁴ See *supra* note 20 and accompanying text.

³⁵ *Phillips*, 415 F.3d at 1313.

³⁶ *Id.* Actually, there are two candidates that vie for coronation as the date of fixation: invention, *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1456 (Fed. Cir. 1998) (en banc), and filing, *Schering Corp. v. Amgen Inc.*, 222 F.3d 1347, 1353 (Fed. Cir. 2000). Because the Federal Circuit recently sought to defuse the tension by noting that in most instances the “time of invention” is “the effective filing date of the patent application,” *Phillips*, 415 F.3d at 1313, this Article presumes that meaning-scope is fixed on the date of filing. However, the opposite presumption would not alter the arguments presented.

³⁷ *Bridge Proprietors v. Hoboken Co.*, 68 U.S. (1 Wall.) 116, 147 (1863).

These two fixation rules do not eliminate the problems of vagueness and ambiguity. Among other issues, courts famously disagree about the relative importance of dictionary definitions and contextually inflected word usages in a patent's disclosure when assessing the legally binding meanings of the words that make up claims.³⁸ Nonetheless, the pinning of meaning-scope to the historically fixed PHOSITA makes word meaning relatively clearer and fosters public notice of claim scope.

Enablement and written description are the two disclosure doctrines implicated in fixation of thing-scope on the date of filing.³⁹ Enablement requires patent applicants to disclose enough information in the specification that accompanies the claims to allow the PHOSITA to make and use the full scope of the claim without undue experimentation at the time the claim is filed.⁴⁰ Written description requires that the patent applicant disclose enough information to demonstrate "invention" or "actual possession" of the full scope of the claim to the PHOSITA at the time the claim is filed.⁴¹ The possession standard is a judicial work in progress, but it seems to require roughly that the patent applicant disclose enough information to demonstrate conceptual possession of the physical structure of the invention.⁴² If patent applicants fail to satisfy either doctrine, their claims are not valid.

It is the inherent knowledge attributed to the PHOSITA that gives rise to the ability of the constructive disclosure to extend beyond the literal disclosure. To stave off the possibility of information overload, patent applicants are encouraged not to disclose what the PHOSITA already knows, to disclose literally only a limited number of embodiments, and to rely on the inherent knowledge of the PHOSITA to extend those literal embodiments into a broader disclosure.⁴³ For example, even if the inventor

³⁸ See *infra* notes 149–51 and accompanying text.

³⁹ 35 U.S.C. § 112 para. 1 (2006). Best mode is also a disclosure doctrine, *id.*, but it does not have a commensurability requirement and thus does not fix claim scope.

⁴⁰ See *Johns Hopkins Univ. v. CellPro Inc.*, 152 F.3d 1342, 1360 (Fed. Cir. 1998).

⁴¹ *Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1366 (Fed. Cir. 2004); *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563–64 (Fed. Cir. 1991).

⁴² See *Enzo Biochem, Inc. v. Gen-Probe Inc.*, 323 F.3d 956, 968 (Fed. Cir. 2002) ("The disclosure must allow one skilled in the art to visualize or recognize the identity of the subject matter purportedly described."). Courts have only recently applied the written description requirement to claims filed with the original application, as opposed to claims amended during the course of prosecution. See *id.* at 979–81 (Rader, J., dissenting from denial of the petition for rehearing en banc) (discussing how written description has only recently come to be viewed as its own doctrine, distinct from enablement, when applied to original claims). Whether courts should apply written description in addition to enablement to originally filed claims is the subject of considerable controversy. *E.g.*, Janice M. Mueller, *The Evolving Application of the Written Description Requirement to Biotechnological Inventions*, 13 BERKELEY TECH. L.J. 615, 633 (1998) (arguing that written description as applied to original claims is an inappropriate "super-enablement" requirement).

⁴³ See *Univ. of Rochester v. G.D. Searle & Co.*, 358 F.3d 916, 923 (Fed. Cir. 2004) ("[C]laimed subject matter 'need not be described in haec verba' in the specification to satisfy the written description requirement.") (quoting *In re Smith*, 481 F.2d 910, 914 (C.C.P.A. 1973)); see also *Hybridtech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384 (Fed. Cir. 1986) ("[A] patent

of a widget discloses only a seven-sided widget that is two inches long and made of wood, she is entitled to a peripheral claim to a “seven-sided widget” that encompasses seven-sided widgets of any length and of any material that the time-bound PHOSITA could conceive (under written description) and make and use (under enablement) upon reading the patent disclosure. How far constructive disclosure extends beyond literal disclosure is affected by a number of variables, including the predictability of the art and whether a large quantity of experimentation would be required to produce a particular embodiment.⁴⁴ Most importantly for the present purposes, however, is the date on which the PHOSITA is rooted. Because the knowledge attributed to the PHOSITA in a technological field may grow over time, a textually identical disclosure may not demonstrate enablement or possession of the claim’s full scope to the PHOSITA of an earlier date, but may nonetheless do so for a PHOSITA positioned later in time.⁴⁵

The disclosure doctrines shape patent protection in two distinct ways. First, they are information-forcing rules. An incentive to disclose justification of patent law depicts patent protection as one side of a *quid pro quo*: the state grants private rights to exclude from the claimed invention to the inventor, and the inventor must disclose to the public information that the patentee otherwise could have attempted to keep secret.⁴⁶ The disclosure doctrines ensure that the inventor fulfills her disclosure obligations and does not strategically withhold information. Second, the disclosure doctrines restrict the permissible thing-scope of a patent claim by mandating that the thing-scope be quantitatively “commensurate with” or “no broader than” the disclosure at the time of filing.⁴⁷ If the inventor claims a set of things that is larger than the set that

[disclosure] need not teach, and preferably omits, what is well known in the art.”)

⁴⁴ *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988) (listing factors that are considered in determining whether undue experimentation would be required to produce an embodiment of an invention in light of the information in the disclosure). The predictability of the art and the quantity of experimentation are important in determining whether a disclosure enables an embodiment of an invention or whether the embodiment is unenabled, scope-actualizing AAT. See *infra* note 194 (defining scope-actualizing AAT). However, predictability is not relevant to understanding how courts sculpt the reach of literal claims into AAT through thing construction, see generally *infra* Part III, and the meaning of meaning, see generally *infra* Part IV.

⁴⁵ See *In re Glass*, 492 F.2d 1228, 1232 (C.C.P.A. 1974).

⁴⁶ See *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 491–92 (1974) (holding that trade secret law is not preempted by federal patent law because of a conflict with the incentive to disclose justification of patent protection).

⁴⁷ *Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473, 1480 (Fed. Cir. 1998) (stating that written description requires “claims [to] be no broader than the supporting disclosure”); *Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200, 1213 (Fed. Cir. 1991) (noting that enablement ensures that claim scope remains “commensurate with” the disclosure). Many formulations of the disclosure doctrines note that valid claims need only be “reasonably” commensurate to the disclosure. See, e.g., *In re Geiger*, 815 F.2d 686, 690 (Fed. Cir. 1987) (Newman, J., concurring). Because reasonableness may provide wiggle room to hide the policy choices that courts make when they construct things and define meaning, this Article does not address it.

she has taught the PHOSITA how to make and use without undue experimentation at the time of filing, the claim is invalid for lack of enablement. Similarly, if the inventor claims a set of things that is larger than the set of which she has demonstrated possession at the time of filing, the claim is invalid for lack of a sufficient written description. If an inventor is not strategically withholding information and cannot enable or demonstrate possession of the claim's full thing-scope on the desired date of filing, she can either delay the filing date until she can satisfy the disclosure requirements or reduce the scope of her claim so that it is commensurate with the disclosure.⁴⁸

C. *The Overt Conflicts Between Fixation and Growth*

The previous subsection outlined the black letter law in the claim construction and disclosure doctrines that requires both the meaning-scope and the thing-scope of a claim to be fixed in some manner on the date that the claim is filed. This subsection examines both how courts have applied these doctrines and how commentators have characterized courts' applications. In some cases, courts interpret the doctrinal mandate for fixation as precluding the expansion of literal claim scope after the date of filing that is required for the claim to encompass AAT. These holdings exemplify the fixation theory: fixation trumps growth in literal claim scope. In other cases, however, courts have expressly recognized that literal claim scope can and should grow after the date of filing so as to encompass AAT. Judges and commentators have depicted these holdings as examples of the growth theory in action: regardless of what black letter law suggests should happen, growth trumps fixation in literal claim scope.

In claim construction, the fixation theory posits that the fixation of meaning-scope makes it impossible for literal claim scope to encompass technologies that were not known to the PHOSITA at the time the claim is filed. In effect, the fixation theory holds that the fixation of meaning-scope at the time of filing entails the fixation of thing-scope at that time.⁴⁹ For example, consider the Federal Circuit's concurring opinion in *Superguide Corp. v. DirecTV Enterprises*.⁵⁰ The *Superguide* court construed the meaning of the claim term "regularly received television signal."⁵¹ The allegedly infringing technology used digital signals, but analog signals were the industry norm and thus the only signals regularly received on the

⁴⁸ If the patent applicant fails to enable or demonstrate possession of any embodiment, reducing claim scope is not an option. See *Glass*, 492 F.2d at 1232-33 (invalidating claims under the enablement doctrine because the specification did not enable any embodiment within the claims).

⁴⁹ See, e.g., *Cotropia*, *supra* note 3, at 165, 167-68.

⁵⁰ *Superguide Corp. v. DirecTV Enters.*, 358 F.3d 870, 896 (Fed. Cir. 2004) (Michel, J., concurring). But cf. *infra* note 230 (arguing that *Superguide* is unusual in that it involves a temporal index).

⁵¹ *Superguide*, 358 F.3d at 876.

date that the claim was filed. Presuming that a post-filing shift in the set of claimed things is tantamount to an impermissible post-filing shift in meaning, the concurrence concluded that the fixation of meaning-scope on the date of filing prevented the claim from reading on devices receiving digital signals.⁵² The majority opinion in *Schering Corp. v. Amgen* also exemplifies the fixation theory brought to bear on claim construction.⁵³ Schering, the patentee, claimed recombinant DNA molecules coding for “a polypeptide of the IFN- α type.” After the claim was filed, new variants of IFN- α unknown at the time of filing were discovered. The Federal Circuit held that fixation of the meaning-scope of the claim left the AAT outside of the patent’s literal scope as a matter of law. “Because, at the time of . . . application, neither [the inventor] nor others skilled in the art knew of the existence of, let alone the identity of, the specific polypeptides now identified as subtypes of IFN- α , those subtypes cannot be within the scope of the claims.”⁵⁴

In contrast to these cases in which the fixation theory explains the outcome of the court’s claim construction, however, there are cases in which courts recognize that the allegedly infringing device incorporates AAT and that there may be literal infringement. For example, the majority opinion in *Superguide* concluded that the literal language of the claim could describe the post-filing regular receipt of digital signals.⁵⁵ The Seventh Circuit’s opinion in *Laser Alignment, Inc. v. Woodruff & Sons, Inc.* also reaches a similar conclusion.⁵⁶ In *Laser Alignment*, the allegedly infringed claim included the limitation “a collimated narrow beam of light.”⁵⁷ The allegedly infringing technology used a laser to produce a type of light beam that was not invented until after the claim had been filed. Like the concurrence in *Superguide*, the district court held that the fixation of meaning excluded AAT from claim scope as a matter of law and that a post-filing change in the thing-scope to which the claim language referred entailed an impermissible post-filing change in meaning.⁵⁸ The Seventh Circuit, however, reversed, concluding that the fixation of meaning-scope on the date of filing did not prevent the claim from reading on AAT.⁵⁹ As the Federal Circuit has stated, “[t]he law . . . does not require that an

⁵² *Id.* at 897 (Michel, J., concurring).

⁵³ *Schering Corp. v. Amgen Inc.*, 222 F.3d 1347, 1353 (Fed. Cir. 2000).

⁵⁴ *Id.* at 1349–50, 1353–54; *see also* *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247, 1263 (Fed. Cir. 2004) (Bryson, J., concurring) (“I think the proper approach . . . is to address cases of new technology by construing claims, where possible, as they would have been understood by one of skill in the art at the time of the invention, and not construing them to reach the as-yet-undeveloped technology . . .”).

⁵⁵ *Id.* at 881.

⁵⁶ *Laser Alignment, Inc. v. Woodruff & Sons, Inc.*, 491 F.2d 866, 871–73 (7th Cir. 1974).

⁵⁷ *Id.* at 869 n.1.

⁵⁸ *Id.* at 871.

⁵⁹ *Id.* at 872–73.

applicant describe in his specification every conceivable and possible future embodiment of his invention.”⁶⁰ To explain these outcomes, commentators have suggested that the principle of *ex ante* fixation has been abandoned and the principle of *ex post* growth has been adopted in its place.⁶¹

Although it is thing-scope rather than meaning-scope that is at issue, there is a parallel conflict between the fixation and growth theories in courts’ applications of the enablement and written description inquiries. The disclosure analyses are doctrinally anchored in time on the filing date,⁶² but precisely how they are anchored—i.e., precisely what must be commensurate with the PHOSITA’s understanding of the disclosure on the date of filing—is a point of contention.

The variant of the fixation theory at work in disclosure cases posits that the full scope of the claim at the time of infringement must be commensurate with the constructive disclosure of the specification at the time of filing. Under the fixation theory, thing-scope must remain commensurate to the time-bound PHOSITA’s understanding of the disclosure from the time of filing through the end of the patent’s twenty-year term.⁶³ By definition, AAT cannot be fully enabled and possessed according to the information that the patentee discloses on the filing date,⁶⁴ so a claim’s thing-scope is not commensurate with the disclosure if it literally encompasses AAT.

In contrast, the variant of the growth theory at work in the disclosure cases concludes that only the full thing-scope of the claim at the time of filing must be commensurate with the constructive disclosure of the specification. In other words, only the thing-scope of the claim at the time of filing needs to be enabled for and possessed by the PHOSITA, and thing-scope is permitted to grow over time thereafter. Under this interpretation, the disclosure doctrines are utterly indifferent to the post-

⁶⁰ *SRI Int’l v. Matsushita Elec. Corp.*, 775 F.2d 1107, 1121 (Fed. Cir. 1985) (en banc).

⁶¹ See *MERGES & DUFFY*, *supra* note 11, at 295–97 (arguing that “[f]or purposes of infringement, . . . the [claim language] is determined at the time of the alleged infringement”); Lemley, *supra* note 4, at 109 (arguing that the Seventh Circuit in *Laser Alignment* allowed the claim to encompass AAT only because it delayed the fixation of meaning until the time of infringement).

⁶² See *supra* note 40–41 and accompanying text.

⁶³ See, e.g., *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247, 1255 (Fed. Cir. 2004) (invalidating a claim under the written description doctrine “[b]ecause [the allegedly infringing AAT] technology did not even exist at the time of the . . . filing, the record conclusively supports that the Chiron scientists did not possess and disclose this technology”); cf. *Tate Access Floors, Inc. v. Interface Architectural Res., Inc.*, 279 F.3d 1357, 1368 (Fed. Cir. 2002) (implying that the contemporary interpretation of the disclosure doctrines generally obviates the need for the reverse doctrine of equivalents because it prevents literal claims from encompassing AAT in the first place).

⁶⁴ If the specification both enables and demonstrates possession of an allegedly infringing technology in all of its particularities on its date of filing, the patent constructively discloses the technology, and the technology cannot be AAT. Cf. *Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1334 (Fed. Cir. 2003) (noting that a method not developed until after a patent was filed cannot be disclosed by the patent).

filing expansion in thing-scope that is triggered by the absorption of AAT into literal claim scope.⁶⁵ In short, growth trumps fixation as the commensurability requirement places no restriction on the ability of literal claim scope to expand and encompass AAT.

D. *The Suppressed, Paradoxical Reality of Both Fixation and Growth*

Both the fixation and growth theories offer logically coherent models of how patent doctrine could, in theory, deal with the relationship between literal claim scope and AAT. As the previous subsection demonstrates, the critical commentary on the relationship between literal claim scope and AAT has been a debate about which of these two theories does or should prevail.

However, this either-growth-or-fixation framework of the commentary fails to capture what actually occurs in the day-to-day reality of contemporary patent practice. Where the fixation and growth theories mandate an election of either fixation or growth in literal claim scope, contemporary patent law seems to achieve a both-and solution on a regular basis. This is the fixation-growth paradox of literal claim scope: literal claims regularly expand to encompass AAT, yet courts usually do not raise a red flag to warn of impermissible growth in claim scope because neither the stability of literal claim scope nor the efficacy of the claim's public notice is threatened.

The simplest way to illustrate that literal claim scope is routinely perceived as remaining fixed while at the same time expanding so as to reach into AAT is to highlight the everyday occurrence of physical blocking patents (blocking patents)—claims in earlier- and later-issued patents that both read on the same technology.⁶⁶ That an inventor from a later generation (improver N+1, or simply N+1) can claim a patentable improvement on the existing technology developed by an inventor from an earlier generation (inventor N, or simply N) is a straight-forward idea.⁶⁷

⁶⁵ The classic case expounding the growth theory is *In re Hogan*, 559 F.2d 595, 605 (C.C.P.A. 1977) (holding that enablement at the time of filing is unaffected by later changes in the state of the art). The idea that the enablement doctrine requires scrutiny of claim scope only at the time of filing is what underlies the "temporal paradox" of enablement and infringement proposed by Robert Merges. See MERGES & DUFFY, *supra* note 11, at 295–97; Merges, *supra* note 15, at 379–80 n.73.

⁶⁶ There are two types of blocking patents. Physical blocking patents involve successive patents that both read on the same thing-token. See, e.g., *Cantrell v. Wallick*, 117 U.S. 689, 695 (1886). Economic blocking patents involve claims that read on physically distinct parts of a thing-token that consumers desire as a whole. See Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, 1010 n.87 (1997) (explaining how patents for distinct yet complimentary goods held by different inventors may block each owner from obtaining maximum economic benefit). To make the point that literal infringement of AAT necessitates some form of post-filing growth most clearly, the discussion in this Part equates blocking patents with physical blocking patents. However, even economic blocking patents mandate a weak form of post-filing growth in literal claim scope. See *infra* note 128.

⁶⁷ Cf. ROBERT C. FABER, *LANDIS ON MECHANICS OF PATENT CLAIM DRAFTING* § 6:8 (5th ed.

However, it is less intuitive that inventor N and improver N+1 may have blocking patents and that N+1 may not be able to practice her invention without N's permission. The counterintuitive nature of blocking patents is attributable, in part, to the weakness of N+1's patent position. Patent law affords N+1 only a right to exclude others from practicing the patented improvement; it does not afford her an affirmative privilege to use her improvement.⁶⁸ Yet, the counterintuitive nature of blocking patents can also be traced to the unexpected strength of N's position. Whenever there are blocking patents, the literal scope of N's earlier or "dominant" claim reaches beyond what N actually invented and encompasses the things produced by N+1's later or "subservient" invention.⁶⁹ N+1's improvement literally infringes N's claim despite the fact that the improvement is, by definition, not known to the PHOSITA who has read the disclosure of N's patent on its date of filing.⁷⁰ In other words, whenever there are blocking patents, the scope of the dominant claim grows over time in some sense and reaches into AAT.⁷¹

For example, consider two blocking-patent hypotheticals involving coffee sleeves. Inventor N invents the clasping coffee sleeve, a strip of cardboard with interlocking slots that, when assembled, insulates a coffee drinker's hand from a hot disposable cup.⁷² Presuming that N is the first inventor of a coffee sleeve, she can disclose her clasping coffee sleeve and lay claim to "an insulating band capable of encircling a disposable cup." After N files her claim, assume also that two improvers from generation N+1 realize that the clasping coffee sleeve actually invented and disclosed by N is not the pinnacle of coffee sleeve technology. The first N+1 invents and patents a lightweight, insulating plastic, and she fabricates clasping coffee sleeves from it. The second N+1 invents and patents a nonobvious geometry for the coffee sleeve that allows the strip to be pre-shaped into a circular band and yet stored in a flat configuration that can be easily made circular with one hand (while the coffee drinker has the hot cup of coffee

2004) (explaining that Jepson claims are frequently used to claim improvements to existing technologies).

⁶⁸ See *supra* text accompanying note 18.

⁶⁹ *Fields v. Conover*, 443 F.2d 1386, 1391 (C.C.P.A. 1971).

⁷⁰ See 35 U.S.C. § 103(a) (2006) (codifying the nonobviousness requirement). Because nonobviousness is measured at "the time the invention was made," *id.*, but claim meaning is fixed on the date the claim is filed, see *supra* note 36 and accompanying text, a limited exception to this rule exists if the subservient invention comes after the invention of the dominant invention but before the date on which a patent to protect the dominant invention is filed.

⁷¹ Technically, the existence of blocking patents is not critical to the fixation-growth paradox. The paradox can arise whenever N's claim grows to encompass N+1's technology and N+1's technology is inventive vis-à-vis N's disclosure. Cf. *supra* text accompanying notes 43–45 (discussing constructive disclosure). The paradox exists even if N+1 does not seek a patent.

⁷² For a picture of N's invention, see *supra* text accompanying note 13. The coffee sleeve is a commonly used technology for teaching basic patent principles, in large part because of its simplicity and familiarity. See, e.g., MERGES & DUFFY, *supra* note 11, at 36–48.

in the other).⁷³

If the patentee N were to sue either of these improvers N+1 for literal infringement, what would a court do? These hypotheticals are designed to be easy cases:⁷⁴ courts would allow N's claim to encompass the N+1s' AAT. In other words, courts would not use the fixation theory. (If they were to use the fixation theory, there would no literal infringement.) Furthermore, unless prompted to do so, the defendants would be unlikely to raise growth-related arguments favoring noninfringement and invalidity. The inclusion of AAT within literal claim scope does not seem to change the meaning of the claim or unmoor it from its fixed meaning at the time of filing before the N+1s discovered their improvements.⁷⁵ Neither the fixation theory nor the growth theory can explain the fixation-growth paradox that characterizes these easy cases.

Post-filing growth literal claim scope without significant disruption of claim stability or public notice pervades the patent regime in many easy cases.⁷⁶ There is nothing special about coffee sleeves. The hypothetical does not involve exceptional facts. To the contrary, the coffee sleeve hypotheticals can be extrapolated to almost any technology.⁷⁷ They

⁷³ For a picture of this second N+1's improvement, see *supra* text accompanying note 13. The Patent and Trademark Office deemed U.S. Patent No. 5,826,786 (filed Oct. 27, 1995), which claims N+1's new geometry, to be nonobvious in light of U.S. Patent No. 5,425,497 (filed June 20, 1995), from which the illustration of inventor N's clasping coffee sleeve is taken.

⁷⁴ *But cf.* Mark Kelman, *Interpretive Construction in the Substantive Criminal Law*, 33 STAN. L. REV. 591, 662-69 (1981) (arguing that interpretive construction is required even in cases that are easy in the sense of being doctrinally uncontroversial in the relevant legal community).

⁷⁵ The statements about what courts and litigants would do are blatant predictions. There is no long history of patent litigation in the art of coffee sleeve technology and patent doctrine concerning AAT as a whole is far from settled, so there is no airtight answer about what the law is in these cases. However, the coffee sleeve hypotheticals are employed, in part, because of the author's belief that the predictions reflect a strong consensus among scholars of patent law about the likely outcome. (Importantly, this consensus about the outcome is not indicative of a doctrinal consensus about why the cases come out this way.) The consensus on the after-arising materiality hypothetical is explicit. *See, e.g.,* Feldman, *supra* note 12, at 9-10 (offering a "one embodiment" rule for enablement when applied to the property of materiality in mechanical inventions); Michael J. Meurer & Craig Allen Nard, *Invention, Refinement and Patent Claim Scope: A New Perspective on the Doctrine of Equivalents*, 93 GEO. L.J. 1947, 1976-77 (2005) (presuming that a claim to a tennis racket can encompass tennis rackets made from after-arising materials if materiality is not expressly recited as a limitation in the claim). Express and on-point prognostication about cases like the after-arising geometry hypothetical, however, is not as common. One reason it is difficult to find examples of cases similar to the after-arising geometry coffee sleeve hypothetical is that such cases are viewed as run-of-the-mill examples of literal infringement and therefore are not litigated.

⁷⁶ Indirect evidence of the prevalence of AAT within literal claim scope can be found in the patent doctrines that would be irrelevant if claims never literally encompassed AAT. *See, e.g.,* O'Reilly v. Morse, 56 U.S. 62, 112-20 (1853) (invalidating claims to "principles" in the abstract); Scripps Clinic & Research Found. v. Genentech, Inc., 927 F.2d 1565, 1581 (Fed. Cir. 1991) (discussing the reverse doctrine of equivalents).

⁷⁷ Because coffee sleeve technology is likely to be considered a discrete innovation industry, the growth in literal claim scope triggered by the inclusion of AAT is not limited to cumulative innovation industries. *But cf.* Cotropia, *supra* note 3, at 190 (arguing that industries characterized by discrete innovation do not generate much AAT). However, the descriptive argument that AAT occurs in all industries does not undermine the existence and normative significance of the distinction between

illustrate situations in which AAT falls within literal claim scope without fanfare—situations that may not even be recognized as involving AAT because no disruption to claim stability seems to be implicated.⁷⁸ These situations may not involve radical technological breaks with the past, but the fixation theory does not purport to draw the difficult line between what does and does not constitute a technological paradigm shift or to exclude from literal claim scope only AAT that exceeds some threshold of social or technological importance.

E. Resolving the Paradox

This Article grapples with the fixation-growth paradox not by insisting that stability be privileged over growth, or vice versa, but by rejecting a premise that structures both theories. Both theories posit that accepting the statements “literal claim scope is fixed on the date of filing” and “literal claim scope grows over time after the date of filing” as true produces a logically impossible patent regime. This Article instead posits that both statements can be true because together they are an equivocation—they mislead by using an ambiguous phrase, namely “literal claim scope,” twice without specifying that each instance of the phrase carries a different meaning.⁷⁹ The concept of literal claim scope in some of its senses can and does remain fixed as of the date of filing, even as the concept expands in other senses in the manner required for a claim to encompass AAT. The paradox of fixed yet expanding literal claim scope can thus be resolved without contradiction by recognizing the multiplicity of concepts that populate the everyday, patent-lawyerly use of the term “literal claim

industries characterized by discrete and cumulative innovation. See *Merges & Nelson*, *supra* note 27, 880–82 (arguing that claim scope should be narrower in cumulative innovation industries). Cumulative innovation industries are those in which major, direction-shifting and/or path-opening technological innovations that build on earlier innovations occur at temporal intervals that are significantly less than the term of a patent. After-arising improvements of the more ordinary, refinement variety occur regularly in both types of industries.

⁷⁸ There is Federal Circuit precedent for dismissing the existence of AAT even when the allegedly infringing technology is a patented improvement covered by a subservient patent. In *Al-Site Corp. v. VSI International Inc.*, the court addressed a patent infringement suit involving hangers for displaying eyeglasses, and its ability to find literal infringement hinged on the fact that the allegedly infringing hangers did not constitute after-arising technology. *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 1320–22 (Fed. Cir. 1999) (using a jury verdict of equivalence under the doctrine of equivalents to find literal infringement as a matter of law under 35 U.S.C. § 112 para. 6 because, *inter alia*, the accused device did not embody AAT). Ignoring the improvement patent on the defendant's technology, *id.* at 1321–22, the court dismissed the existence of AAT by zooming in, framing the defendant's technology as nothing more than the “holes” that exist in the hanger, and stating that “holes do not constitute an after-arising technology.” *Id.* at 1322. By framing the physical part of the defendant's device that corresponded to a particular claim limitation so narrowly, the court framed the after-arising aspect of the technology out of existence. Similarly, in the coffee sleeve hypothetical, a court might just say bands generically are not AAT, ignoring the relevant after-arising geometry that clearly makes the defendant's band after-arising.

⁷⁹ See THE AMERICAN HERITAGE DICTIONARY OF THE ENGLISH LANGUAGE 604 (4th ed. 2000) (defining “equivocal” as “[o]f uncertain significance”).

scope.” One way in which to frame the goal of this Article is simply to tease out the different meanings that, without adequate differentiation, are commonly invoked when courts and commentators talk about literal claim scope.

The equivocation-based response to the paradox is, in theory, a simple one, but there is a redundancy that makes the project more complex. There is not a single mechanism for resolving the paradox. There are two independent mechanisms, each of which implicates a different category of AAT. One mechanism focuses on the nature of things and the way in which thing-scope can be fixed in one sense and yet expand in another to encompass AAT. The other addresses an ambiguity in the meaning of meaning. Under one definition of meaning, but not the other, meaning-scope can remain fixed on the date of filing while allowing thing-scope to expand over time to encompass AAT. Parts III and IV address each of these mechanisms in turn.

III. THING CONSTRUCTION

Although claim construction is a well-known practice in patent infringement litigation, this Part argues that courts must also regularly engage in thing construction in patent cases involving allegedly infringing AAT. The distinct things that serve as the metric of thing-scope are conceptual, not physical, entities. They are types, not tokens, and therefore they do not have fully formed, objective existences prior to patent infringement proceedings. Before courts can determine whether thing-scope has remained fixed or grown over time, they must initially construct the thing-types that are required to calculate thing-scope.⁸⁰ Thing construction holds the key to explaining one mechanism through which the fixation-growth paradox operates to achieve a both-stability-and-growth result in the disclosure doctrines. In other words, thing construction exposes one reason why in some cases it is not necessary to elect either the

⁸⁰ This Part does not argue that courts construct the tangible or extensional instances of infringing things. It offers only a weak construction thesis. The construction lies in human cognition: courts construct the thing-types that classify and give order to their understanding of what the infringing thing-tokens are. This weak construction thesis is deeply influenced by the work of both Mike Madison and Mark Kelman. Madison has argued that it is important to be conscious of the construction of not only legal doctrine but of things as well in order to understand and shape intellectual property law. See generally Michael J. Madison, *Law as Design: Objects, Concepts, and Digital Things*, 56 CASE W. RES. L. REV. 381 (2005) (categorizing and evaluating five methods of thing-making). But cf. *infra* note 239 (disagreeing with Madison that courts uniformly employ a things by nature approach in patent law). Kelman makes the argument more sweepingly. Courts must engage in “interpretive construction” to turn the events to which law is applied into something courts can analyze doctrinally. Interpretive construction can be outcome determinative because it produces the premises upon which courts unleash doctrinal logic (or “rational rhetoricism” in Kelman’s terms). See Kelman, *supra* note 74, at 591–93 (discussing two phases of legal argument: interpretive construction and rational rhetoricism). Following Madison’s lead, this Part merely illustrates that courts also produce things through interpretive construction before they unleash rational rhetoricism.

fixation theory or growth theory when explaining how the disclosure doctrines work. Certain thing constructions, but not others, allow the fixation of literal thing-scope at the time of filing and yet still permit the literal claim to encompass AAT when it is subsequently discovered.⁸¹

Part III.A initially offers a proof of principle. Using a simplistic hypothetical to make its point clearly, it demonstrates how courts can use thing construction to make a claim read on AAT without triggering post-filing expansion of thing-scope. Courts have discretion to construct thing-types in either a coarse- or fine-grained fashion. Through a coarse-grained thing construction, courts throw large genres of distinct infringing thing-tokens into a single conceptual thing-type basket, thereby masking the existence of the growth that a claim undergoes when it encompasses AAT. The coarser courts make thing-types during thing construction, the larger the number of after-arising improvements that can infringe without triggering an expansion in thing-scope.

Part III.B then takes a rough first pass at understanding the conditions under which courts actually regulate the reach of literal claim scope into AAT by constructing things either finely or coarsely. A philosophical literature addressing the nature of things posits a distinction between the properties that a thing possesses intrinsically and those that it possesses extrinsically—a distinction that can be traced to a physical or micro-structural essentialism about what things really are. This distinction explains some, but not all, of courts' thing constructions. Courts rely on the distinction between intrinsic and extrinsic properties to place a hard limit on how finely they construct things. However, it is not clear whether courts use the distinction to place a hard ceiling on how coarsely they construct things.

⁸¹ The importance of thing construction can be most easily seen by assuming for the sake of argument that the disclosure doctrines require fixation of thing-scope at the time of filing. If one accepts the growth theory for thing-scope—i.e., if one accepts that only the thing-scope of the claim at the time of filing needs to be commensurate with the disclosure, *see supra* note 65 and accompanying text—then there is less riding on thing construction. However, universal acceptance of the growth theory does not provide an intuitively satisfying explanation for the way in which literal claims reach into AAT in all situations. In some instances, thing construction provides an explanation that is better at saving the appearances of contemporary patent practice and discourse. *See infra* text accompanying notes 136, 146. Furthermore, even if one accepts a growth theory for thing-scope in all cases, thing construction may still be important in explaining the reach of literal claim scope into AAT. If one accepts that growth in thing-scope entails growth in meaning-scope, and one adopts the fixation theory as applied to meaning-scope, then thing construction offers the only mechanism to allow AAT to fall within the literal scope of a claim with a fixed meaning. If thing-scope remains fixed at the time of filing, then meaning-scope, too, remains fixed at that time. Thus, if a court deploys thing construction so that the claim can encompass AAT without adding new thing-types to the claim, there is no need to worry about post-filing shifts in meaning-scope. *Cf. infra* Part IV (arguing that the meaning of meaning determines whether the fixation of meaning-scope entails the fixation of thing-scope).

A. Coarse-Grained Things and the Masking of Growth in Thing-Scope

Courts construct the things encompassed by a patent claim when they categorize the infinite array of infringing tokens of things into the discrete conceptual baskets or thing-types that are tallied to determine the claim's thing-scope.⁸² Thing construction is simply the identification of the subset of the thing-tokens' properties that are relevant to the identities of the tallied thing-types.

For example, assume a simplistic claim to "paper" by the first inventor of paper. Assume also a specification that discloses to the time-bound PHOSITA, either literally or constructively, sheets of paper with a wide variety of properties including sheets of paper in letter and legal sizes, sheets of paper that are dyed both yellow and blue with different chemicals, and sheets of paper inside and outside of computer-printer paper trays.⁸³ How should a court calculate the claim's thing-scope? Artificially restricting the inquiry to the embodiments recited above, does the claim describe one, two, four or eight types of things? If there are two infringing sheets of paper on my desk that are as identical as imaginable, yet one is dyed yellow and the other blue, are they instances of distinct types of things or are they duplicates of the same type of thing? By answering these questions, courts construct things in patent law and establish the metric by which thing-scope is measured.

Thing construction determines which properties of an allegedly infringing technology are and are not overlooked in defining the identity of a thing-type.⁸⁴ For example, assume that a first court treats all sheets of

⁸² See *supra* notes 27–29 and accompanying text (defining thing-scope). Categorization is not unique to patent law. It is a fundamental aspect of cognition: the human mind routinely "breaks down" the complexity and continuity of physical reality into discrete categories or types that can be more readily stored, managed and processed. See DICTIONARY OF COGNITIVE SCIENCE: NEUROSCIENCE, PSYCHOLOGY, ARTIFICIAL INTELLIGENCE, LINGUISTICS, AND PHILOSOPHY 41 (Oliver Houdé ed., 2004) (defining categorization). Thing construction is analytically distinct from the categorization that occurs in claim construction and literal infringement. The latter tasks, which are the usual suspects in the analysis of categorization in patent law, involve categorization in what might be considered its forward direction. They start with a category defined by the claim language and query what belongs in the category by identifying the criteria needed for inclusion in the category (claim construction) and determining whether a given thing-token satisfies those criteria (literal infringement). The construction of things, however, runs the categorization process in reverse. Given a set of infringing technologies, what are the categories that one should create in order to house them? Although the claim language determines the extent of the group of infringing things that must be categorized, it does not provide the criteria that define the conceptual thing-type baskets into which those infringing things should be sorted.

⁸³ The term "properties" is used here more or less in its colloquial sense. Properties are simply "the attributes or qualities or features or characteristics" that things possess. Chris Swoyer, *Properties*, in STANFORD ENCYCLOPEDIA OF PHILOSOPHY § 1.1, <http://plato.stanford.edu/entries/properties/> (last visited Aug. 29, 2008) (offering an overview of the nuances in the notion of the properties of a thing).

⁸⁴ The process of categorization in its reverse direction, see *supra* note 82, is inherently reductive, and the construction of thing-types that contain thing-tokens therefore erases many differences.

paper, regardless of the particular chemicals with which they are dyed, as instances of a single thing-type. The court erases the property *being dyed with a specific chemical* from the legal identity of the claimed things during thing construction. Sheets of paper that possess the property *being dyed with chemical X* are thrown into the same conceptual thing-type basket as sheets of paper that have the incompatible property *being dyed with chemical Y*. However, a second court might not overlook the property *being dyed with a specific chemical* when constructing thing-types. It might treat sheets of paper that are dyed with different chemicals as distinct thing-types. In tallying thing-scope, the two different courts use different metrics for measuring the thing-scope of the claim to “paper.” The first court concludes that the thing-scope of the claim to “paper” is smaller than the second court does, but only because it performs the measurement with a larger unit of measure.

More broadly, the number of properties overlooked or erased during thing construction can be measured in terms of the coarseness or fineness of the granularity at which things are constructed. The more coarse the grain of the thing-types is, the larger the number of properties erased and the larger the set of discernable instances of things that is thrown into the same conceptual thing-type basket.⁸⁵ However, the more coarsely grained the thing-types are, the smaller the final, quantified tally of the claim’s thing-scope and the fewer the distinct conceptual baskets of thing-types that need to be counted. In contrast, fine-grained thing-types involve the erasure of fewer properties, the inclusion of smaller sets of discernable instances of things within a single type, and the tallying of more thing-types to determine thing-scope.

Thing construction may seem esoteric because, unlike claim construction, it is irrelevant to the outcome of many cases. Why should one care whether thing-scope is twice as large numerically if the units of measurement are half as big? It is as though the first court describes a distance as one mile and the second court describes the same distance as two half-miles. Whenever an allegedly infringing technology is constructively disclosed by a patent specification, the quantification of thing-scope, and thus the construction of things, presents a purely academic issue. If the allegedly infringing thing is enabled and possessed in all of its particularities at the time of filing, courts do not need to construct things. However, when the allegedly infringing technology is AAT, the manner in which courts construct things is not a purely academic exercise. Rather, it is dispositive of whether the thing-scope of a literal claim can both remain fixed at the time of filing and grow to encompass

Categorization assigns thing-tokens to thing-types with reference to some, but not all, of the properties that the tokens possess.

⁸⁵ Cf. *infra* text accompanying note 106 (defining “indiscernibles” as a term of art).

AAT at the same time.

To understand the importance of thing construction in cases involving AAT, it is initially critical to understand that the AAT implicated in the fixation-growth paradox can always be defined in terms of after-arising properties for preexisting things. Such AAT is after-arising because N+1 invents a new property or set of properties for a thing that N has already invented and described, either literally or constructively.⁸⁶ The hypothetical coffee sleeves introduced in the previous Part are after-arising because, in relation to the original inventor's disclosure of the clasping coffee sleeve, they possess the after-arising property of either *being made from an after-arising plastic* or *being folded in an after-arising geometry*.⁸⁷ An allegedly infringing instance of a sheet of paper may be after-arising in relation to the disclosure of the patent that claims "paper" because the sheet has the property of *being dyed green with an after-arising chemical*. Similarly, an allegedly infringing sheet of paper could be after-arising because it has the property *being in the paper-tray of an after-arising computer printer*.⁸⁸ Considered in all of their particularities, neither a sheet of paper that is dyed green with an after-arising chemical nor a sheet of paper in the paper tray of an after-arising printer could have been constructively disclosed by the patent claiming "paper." This conclusion is inherent in the definition of after-arising.⁸⁹

Here is the payoff of reframing AAT in terms of after-arising properties for preexisting things: thing construction can mask the post-filing growth in literal thing-scope that is required for a claim to encompass AAT if it employs a coarse-grained construction and erases the property that marks the AAT as after-arising. This erasure renders the after-arising property irrelevant to the identity of thing-types and the distinctions between them. When the after-arising property is not a definitional property of the tallied thing-types, the allegedly infringing AAT can be thrown into a preexisting conceptual thing-type basket created for the constructively disclosed embodiments. The claim's thing-scope need not expand over time for the AAT to infringe. In contrast, if the property that makes the allegedly infringing technology after-arising is a property that defines the thing-types tallied to measure thing-scope, then thing-scope cannot encompass the AAT and, at the same time, remain

⁸⁶ Perhaps some AAT can only be understood as a thing with entirely new properties. However, not only is such radical AAT unusual (if in fact it exists), it is unlikely to be implicated in the fixation-growth paradox because it will rarely fall within an earlier inventor's claim.

⁸⁷ See *supra* text accompanying note 72-75 (presenting the coffee sleeve hypotheticals).

⁸⁸ It is difficult to conceive of an appropriate hypothetical based on the final example of a property for a sheet of paper considered above, namely the property *having a particular size*. See *supra* text accompanying note 83. An after-arising size that is not constructively disclosed by the specification in the patent claiming "paper" is difficult to imagine.

⁸⁹ See *supra* note 64 and accompanying text.

fixed as of the time of filing. The introduction of a new, distinct thing-type within literal claim scope makes the tally of things described by the claim at the time of infringement larger than the tally of things that the PHOSITA at the time of filing recognizes as enabled and possessed in light of the disclosure. When thing construction produces thing-types at a relatively fine level of granularity, no both-and solution is possible. Either stability must trump growth, or growth must trump stability.

Consider again the two courts that adopt different metrics for measuring the thing-scope of the “paper” claim, the first identifying yellow and blue paper as distinct thing-types, and the second overlooking the difference in the property of color and classifying the yellow and blue sheets of paper as two instances of the same thing-type.⁹⁰ If the allegedly infringing product is AAT in the form of a sheet of paper with the property *being dyed green with an after-arising chemical*, and if the disclosure doctrines require thing-scope to be stabilized on the claim’s filing date, then thing construction determines whether thing-scope can remain fixed and still encompass the AAT. The first court (which constructed things in a relatively fine manner) must conclude that the green paper is not within the fixed thing-scope of the claim. The green paper is an instance of a distinct thing-type not constructively disclosed in the specification, and the thing-scope of the claim cannot grow after the date of filing to encompass it. Thus, either the “paper” claim is invalid under the disclosure doctrines or there is no literal infringement. In contrast, the second court (which constructed things in a relatively coarse manner) should conclude that the after-arising green paper is within the fixed thing-scope of the claim. The color that the sheet of paper is dyed is irrelevant to the identity of a thing-type; the AAT is treated as the exact same type of thing that was constructively disclosed in the patent specification. Here, the “paper” claim is enabled and possessed, and the AAT literally infringes.

The same story about thing construction and its importance to the reach of fixed thing-scope into AAT can be told using the property *being in the paper-tray of an after-arising computer printer* rather than the property *being dyed green with an after-arising chemical*. Whether this AAT can fall within the thing-scope of a claim to “paper” that has been fixed on the date of filing also depends on whether the court constructs things finely—viewing paper inside and outside of paper trays as distinct types of things—or coarsely—overlooking the property of *being in a paper tray*—when identifying the thing-types that must be tallied to measure the claim’s thing-scope.

Couched in the language of equivocation,⁹¹ the both-and result of fixation of thing-scope at the time of filing and growth in thing-scope after

⁹⁰ See *supra* text accompanying note 84.

⁹¹ See *supra* text accompanying note 79.

that date to encompass AAT is possible because the term “thing-scope” is ambiguous. The distinct things that comprise thing-scope can be defined at coarser or finer levels of granularity. By choosing a coarse-grained definition of things as the legally relevant definition, courts can mask the growth in thing-scope that is appreciable only with a fine-grained definition. The ambiguity between coarse and fine things allows courts to focus on coarse-grained thing-scope when monitoring commensuratensness under the disclosure doctrines and render legally irrelevant whatever growth occurs in different, more finely parsed metrics of thing-scope. Thing-scope (coarse-grained) is fixed, and thing-scope (fine-grained) grows. It is thus the negative implication of a coarsely defined thing that resolves the fixation-growth paradox without a logical contradiction. Whenever a property is not relevant to the conceptual basket or thing-type in which a thing-token belongs, that property may reflect technology not developed until after a claim is filed and yet no change in the claim’s thing-scope occurs when the claim encompasses the AAT.

In sum, thing construction can determine whether a literal claim with a thing-scope fixed on the date of filing can remain valid while encompassing AAT. Coarse-grained thing-types explain one mechanism through which courts can achieve both the fixation of thing-scope at the time of filing and the growth required for a claim to literally encompass AAT.

B. *What Courts Do*

At what granularity do courts actually construct things in contemporary patent practice? How do they distinguish the bundle of properties that they use to define thing-types from the remaining properties that they overlook? These questions are of practical import in patent law because, as explored in the previous subsection, the level of granularity at which things are defined determines whether a claim can have a thing-scope that has been fixed on the date of filing and, at the same time, still encompass AAT. In some situations, thing construction determines whether literal claims can achieve both stability and growth.

There are no statutes specifying the rules that courts should use to establish the granularity of things, so the parameters controlling thing construction are entirely within the hands of the judiciary. One possibility is that courts have unfettered discretion in thing construction. Perhaps the stability of literal claim scope is nothing more than a conceptual shell game, and courts routinely make growth in thing-scope appear or disappear through a sleight-of-hand shift in granularity. Such discretion would in turn allow courts to extend or truncate the reach of literal claim with a fixed thing-scope into AAT by validating or invalidating, respectively, claims under the commensurability analysis of the disclosure doctrines. At the opposite end of the spectrum, another possibility is that courts feel

bound by a strict set of rules to always classify certain properties as relevant to the identity of a thing-type and other properties as irrelevant. Perhaps the properties of a thing that make it the type of thing that it is are defined by nature or convention before patent law comes into the picture. Furthermore, perhaps courts are bound by these rules either consciously or unconsciously. If this is true, then courts do not, as a practical matter, exercise any discretion at all during thing construction.

This subsection presents one candidate for an extra-legal distinction that could, in theory, be guiding courts' decisions during thing construction: the distinction between the intrinsic and extrinsic properties of a thing. Embodying a structural or physical essentialism about what things are and reflecting the way in which things are commonly discussed in everyday language beyond patent rhetoric, the distinction makes explicit what are arguably shared and wide-spread intuitions about things. The intrinsic properties of a thing are those properties that are wound up with making a thing the thing that it is, whereas the extrinsic properties of a thing are the properties that are not wound up in the identity of the thing. If the distinction between intrinsic and extrinsic properties were to guide courts during thing construction, courts would always use the intrinsic properties of a thing to define thing-types, but they would never use the thing's extrinsic properties to define thing-types.

This subsection tests the hypothesis that the distinction between intrinsic and extrinsic properties determines courts' decisions during thing construction against the Federal Circuits' holdings in cases involving allegations that AAT falls within literal claim scope. It concludes that the hypothesis is clearly consistent with the case law regarding the role of extrinsic properties in thing construction. Courts appear to be firmly under the sway of an essentialist understanding of things during thing construction insofar as they never use extrinsic properties to define thing-types. However, no conclusion can be reached with respect to whether the inverse is true and whether courts always use intrinsic properties to define thing-types during thing construction.

1. *The Intrinsic and Extrinsic Properties of a Thing*

Some philosophers interested in the nature of things posit a metaphysical distinction between the properties a thing possesses intrinsically and those second-class properties it merely possesses extrinsically—its intrinsic and extrinsic properties for short.⁹²

⁹² See generally Robert Francescotti, *How to Define Intrinsic Properties*, 33 NOÛS 590 (1999) (arguing that the intrinsic/extrinsic distinction remains a useful philosophic tool); I.L. Humberstone, *Intrinsic/Extrinsic*, 108 SYNTHÈSE 205 (1996) (exploring the distinctions between the extrinsic and intrinsic properties); David Lewis, *Extrinsic Properties*, 44 PHIL. STUD. 197 (1983) (critiquing a proposal for distinguishing intrinsic and extrinsic properties); Theodore Sider, *Intrinsic Properties*, 83 PHIL. STUD. 1 (1996) (distinguishing between intrinsic and extrinsic properties); Peter Vallentyne,

Philosophers who are interested in the distinction work to define and defend it because they believe that it explains “legitimate intuitive considerations” about the nature of the things that exist in the world.⁹³ In gross, the intuition is that not all of the properties of a thing-token are equally tied up with making that thing-token the type of thing that it really is.

Only some of a thing’s properties—the intrinsic ones—derive entirely from what the thing is. “A thing has its intrinsic properties in virtue of the way that thing itself, and nothing else, is.”⁹⁴ An intrinsic property of a thing is “a property that a thing has (or lacks) regardless of what may be going on outside of itself.”⁹⁵ Intrinsic properties can be traced back to the thing itself without any other explanation or contribution.

In contrast, other properties—the extrinsic ones—are dependent upon the context of the thing or its relationships to things other than the thing being examined.⁹⁶ Residually defined, as they usually are, extrinsic properties are the properties that are “not entirely about that thing” and that “may depend, wholly or partly, on something else.”⁹⁷

Archetypes of the extrinsic properties are relatively uncontroversial: the properties of *being an uncle* or *being six meters from a rhododendron* are extrinsic properties of Sam and my pencil, respectively.⁹⁸ These properties describe properties of a thing-token that follow, at least in part, from something other than the thing itself. Sam is an uncle because his brother or sister has a child. A pencil is six meters from a rhododendron, in part, because of the nature of the rhododendron at issue.⁹⁹ Although the identification of intrinsic properties can be more controversial, *being six meters tall*, *being circular* and *having an internal structure with two parts*

Intrinsic Properties Defined, 88 PHIL. STUD. 209 (1997) (defining intrinsic and extrinsic properties); Stephen Yablo, *Intrinsicness*, 26 PHIL. TOPICS 479 (1999) (discussing intrinsic properties). Although the terms “intrinsic” and “extrinsic” are used adjectivally to modify properties for the sake of convenience, they are meant to evoke a local rather than global concept of intrinsicity. This local concept is most commonly expressed through the adverbial formulations intrinsically and extrinsically possessed properties. See Humberstone, *supra* at 206–07 (explaining the global/local distinction).

⁹³ Humberstone, *supra* note 92, at 205. Because the philosophical work involves flushing out a commonplace intuition, explanations of the distinction between intrinsic and extrinsic properties often start from the assumption that people are already familiar with the basic notion of an intrinsic property. See, e.g., Yablo, *supra* note 92, at 479 (“You know what an intrinsic property is . . .”). Philosophers are also motivated to establish and defend the distinction because it proves to be a useful tool in a variety of philosophical projects that are not relevant here. See, e.g., Humberstone, *supra* note 92, at 207 (listing projects).

⁹⁴ Lewis, *supra* note 92, at 197.

⁹⁵ Yablo, *supra* note 92, at 479.

⁹⁶ Cf. Humberstone, *supra* note 92, at 209–27 (suggesting that a relational property is a distinct sub-type of an extrinsic property).

⁹⁷ Lewis, *supra* note 92, at 197.

⁹⁸ *Intrinsic vs. Extrinsic Properties*, in STANFORD ENCYCLOPEDIA OF PHILOSOPHY, *supra* note 83.

⁹⁹ Extrinsic properties may be admixtures to varying degrees. Lewis, *supra* note 92, at 197 (“[B]eing a brother has more of an admixture of intrinsic structure than being a sibling does, yet both are extrinsic.”).

are intrinsic in most circumstances.¹⁰⁰ The shape of a thing is often taken as a paradigm of an intrinsic property: that the pencil on my desk is four inches long, that it is six-sided in cross-section and that it is pointed on one end are properties that the particular pencil has in and of itself.¹⁰¹ Materiality, too, is conventionally viewed as an intrinsic property.¹⁰² The fact that my pencil is made of wood and graphite is true because of the way the pencil, and nothing else, is.

The payoff of subscribing to the distinction between intrinsic and extrinsic properties comes from being able to tell what a thing actually is on a metaphysical level. Not only are intrinsic properties solely about the way a thing-token is, but the nature of a thing “is given by the totality of its intrinsic properties.”¹⁰³ Thingness is equated with the totality of intrinsic properties. A tally of a thing’s intrinsic properties is both necessary and sufficient to identify the thing-type to which the instance of the thing belongs. Inversely, a tally of its extrinsic properties is not required. Thus, the distinction between intrinsic and extrinsic properties leads to the conclusion that the intrinsic property *being four inches long* is constitutive of the thing that my pencil is but the extrinsic property *being six meters from a rhododendron* is not.

Proponents of defining things in terms of their intrinsic but not extrinsic properties argue that the distinction merits recognition and study because it legitimizes strong, shared intuitions about the nature of what things are. To illustrate the strength of these intuitions, they invoke two common-sense concepts about things that can be explained only by reference to the intrinsic/extrinsic distinction (or, at least, some distinction akin thereto): the concepts of *duplicates* versus *indiscernibles* and *real change* versus *mere Cambridge change*.

It is perfectly intuitive to talk about two thing-tokens as duplicates. Sentences like “This pencil over here is a duplicate of that one over there” and “These two sheets of paper are duplicates” are commonplace. Such talk is possible, however, only because of the intuitive nature of the distinction between intrinsic and extrinsic properties. Without such a distinction, no two things in the actual world could be labeled as duplicates. Two thing-tokens are intuitively viewed as duplicates if they are perceived as being “exactly alike” as things.¹⁰⁴ Yet, no two thing-tokens existing in the actual world at the same time can be exactly alike in all of their properties. At a minimum, they are located in different positions in space. The distinction between intrinsic and extrinsic

¹⁰⁰ See *id.* (listing shape as an intrinsic property).

¹⁰¹ But see generally Bradford Skow, *Are Shapes Intrinsic?*, 133 PHIL. STUD. 111 (2007) (arguing that it is difficult to defend shape as an intrinsic property in every instance).

¹⁰² See Lewis, *supra* note 92, at 197 (listing internal structure as an intrinsic property).

¹⁰³ *Id.*

¹⁰⁴ See *id.*

properties sheds light on the properties that two thing-tokens must share to be duplicates. Intrinsic properties are those properties with respect to which duplicates may not differ; things are duplicates if and only if they share all of their intrinsic properties.¹⁰⁵ Because size is an intrinsic property, a cube with one-inch sides is not likely to be perceived as a duplicate of a cube with two-inch sides. Residually, extrinsic properties are those properties that may differ between duplicates. Because relation to a rhododendron is an extrinsic property, a pencil that is six meters from a rhododendron can be a duplicate of a pencil with the same size, shape, and materiality that is seven meters from the rhododendron. Importantly, two things that are duplicates are not indiscernibles—they do not share all of their properties, both intrinsic and extrinsic.¹⁰⁶ Duplicate pencils that are six and seven meters distant from a rhododendron are discernibly different, but they are still duplicate things because distance from a rhododendron is a mere extrinsic property of the pencil-as-thing. In sum, without the distinction between intrinsic and extrinsic properties, it is gibberish to talk about things that are duplicates, and all that can really be said about two instances of things is that they are discernable.

The intrinsic/extrinsic property distinction is also useful to differentiate between two intuitively different types of change that things undergo. A thing that undergoes a change in an intrinsic property is said to experience real change while a thing that undergoes a change in an extrinsic property is said to experience mere Cambridge change.¹⁰⁷ When my four-inch long pencil is sharpened so that it is only three inches long, the pencil has undergone real change. It is a different thing after the change has happened; it is not a duplicate of its former self. Similarly, if my pencil were miraculously to transmute from being a wooden pencil to being a plastic pencil, the change would be real change. (To avoid the pitfalls of positing such miraculous change, the idea of mere Cambridge change can be modified to mere Cambridge contingency.)¹⁰⁸ In contrast, when a pencil is moved one meter closer to a rhododendron (or, even more strikingly, a rhododendron is moved one meter closer to a pencil) or when Sam's sibling has a child, the thing in question (either the pencil or Sam) has undergone a much weaker kind of change. This weaker type of change still makes a thing-token take on properties that it did not have beforehand

¹⁰⁵ *Id.*

¹⁰⁶ DAVID LEWIS, ON THE PLURALITY OF WORLDS 62–63 (1986). Indiscernability is the tighter bond between two objects. It is a bond so tight that it is impossible to formulate common sense examples of indiscernible things in the actual world, as two material objects cannot occupy the same location in space simultaneously.

¹⁰⁷ Humberstone, *supra* note 92, at 207–09.

¹⁰⁸ *See id.* at 209 (explaining that a Cambridge contingency “arise[s] whenever some predicate true of [an object] *x* might not have been”). According to this formulation, a property is extrinsic if, in the contingent situation that a thing does not have the property, there is no “genuine respect” in which the thing is different. *Id.*

and lose others that it previously had, but, in an intuitively important way, the thing is still the same thing that it was before the change occurred.¹⁰⁹ The pencil is still intrinsically the same pencil; Sam is still intrinsically the same person. This weaker type of change is mere Cambridge change. Again, without the distinction between intrinsic and extrinsic properties, the idea that there is a difference in the change that Sam undergoes when Sam grows taller and when Sam's sibling has a child would be an illusion.

Although the concepts of duplicates and mere Cambridge change can be used as rules of thumb or litmus tests for sorting a thing's intrinsic properties from its extrinsic properties, they do not provide an analytical definition for the intrinsic/extrinsic property distinction. They do not explain an unknown concept in terms of simpler, known ones, because there is no way of defining duplicates or mere Cambridge change other than in terms of intrinsic and extrinsic properties. All three concepts form a "tight little family of interdefinables."¹¹⁰ The concepts of duplicates and mere Cambridge change only underline the value of the intrinsic/extrinsic property distinction in explaining our basic intuitions about the world. The more important to understanding the world of things these two concepts are taken to be, the stronger the case for distinguishing intrinsic and extrinsic properties.¹¹¹

The distinction between intrinsic and extrinsic properties should not be confused with the Aristotelian distinction between essential and accidental properties, respectively.¹¹² Extrinsic properties do not map onto accidental properties on a one-to-one basis. For example, size is an accidental yet intrinsic property of a tree. More importantly, Aristotle's notion of accidental and essential properties hinges on the existence of natural kinds in a way that the distinction between intrinsic and extrinsic properties does not. In the Aristotelian schema, an *a priori* hierarchy of differences divides the world into sets of things called natural kinds. Each natural kind has a "real" definition or a set of essential properties, namely the differences that structure the *a priori* hierarchy, and part of the search for understanding involves identifying the natural kinds and their "real" definitions or essential properties.¹¹³ Inversely, sets of things that are not

¹⁰⁹ There are instances in which the association of extrinsic properties and mere Cambridge change fails because extrinsic properties are admixtures. See Lewis, *supra* note 92, at 197. For example, *being taller than b* is an extrinsic property of thing *a* (provided that *a* is not a part of *b* and *b* is not a part of *a*) in that it is not a property that *a* has in and of itself. However, *a* can lose this property either through real change in a shift in *a*'s height or through mere Cambridge change in a shift in *b*'s height. Humberstone, *supra* note 92, at 208.

¹¹⁰ Lewis, *supra* note 92, at 197.

¹¹¹ Cf. *id.* (arguing that "giv[ing] over the entire family as unintelligible and dispensable . . . would be absurd").

¹¹² See J. Michael Dunn, *Relevant Predication 2: Intrinsic Properties and Internal Relations*, 60 PHIL. STUD. 177, 181 (1990) (criticizing "a tendency . . . to conflate intrinsic properties and essential properties").

¹¹³ See Michael R. Ayers, *Locke Versus Aristotle on Natural Kinds*, 78 J. PHIL. 247, 250–53

natural kinds do not have essential properties. It makes no sense to search for the essential properties of the thing *cup on a book*, because cups-on-books are not a natural kind.¹¹⁴ In contrast, embracing the notion of intrinsic properties does not, in any way, presuppose that there is a correct set of lines for dividing the world into natural-kind components. Regardless of how much matter falls within the frame chosen to delineate a thing, all things—including the things *cups on books*—have intrinsic properties.

However, the physical framing of the thing under consideration can affect whether any given property is intrinsic or extrinsic. Whether a property is intrinsic or extrinsic is contingent on the amount of matter that is included within the thing under consideration:

A sentence or statement or proposition that ascribes intrinsic properties to something is entirely about that thing; whereas an ascription of extrinsic properties to something is not entirely about that thing, though it may well be about some larger whole which includes that thing as a part. A thing has its intrinsic properties in virtue of the way that thing itself, and nothing else, is. Not so for extrinsic properties, though a thing may well have these in virtue of the way some larger whole is.¹¹⁵

The things *a pencil* (“a thing” in the quote above) and *a pencil six meters from a rhododendron* (a different thing that is the “some larger whole” in the quote above) both have intrinsic properties. However, the particular property *being six-meters from a rhododendron* is, when predicated of the pencil, intrinsic to the latter because it establishes a relationship among parts and extrinsic to the former because it is not only about the pencil.

Although not governed by an Aristotelian variant of essentialism, the intuitive idea that some properties are intrinsic to a thing whereas others are not does, nonetheless, reflect a different and more modern type of essentialism that infects our everyday thinking. This essentialism is scientific, physical, and structural: two things are identical if and only if they have all of the same “micro-structure,” “important physical

(1981) (discussing natural kinds). The confusion between accidental and essential properties follows from the fact that it is possible to describe a natural kind with only accidental properties and a thing with only extrinsic properties. Man is man because he is a rational animal not because he is a featherless biped, despite the fact that the latter, so-called necessary properties pick out the same set of things in the actual world that the former, essential properties do. *Id.* at 252; see also DAVID CHARLES, ARISTOTLE ON MEANING AND ESSENCE 18–19 (2000) (distinguishing essential and necessary properties). Similarly, one can describe something with reference only to its accidental properties, for example, the thing that is next to the telephone.

¹¹⁴ See Ayers, *supra* note 113, at 252.

¹¹⁵ Lewis, *supra* note 92, at 197.

properties,” or “determining and basic scientific feature[s].”¹¹⁶ The list of the most basic of intrinsic properties from which higher-order intrinsic properties like shape can be constructed resonates in quantum physics: spin, charge, and mass.¹¹⁷ Thus, the most precise list of the intrinsic properties of a thing roughly, or perhaps exactly, trace the identity of a thing to what physicists and chemists say things are.¹¹⁸ Reductively speaking, the things that make up the world are defined first and foremost by their internal structures.

2. *The Hypothesis: The Distinction Between Intrinsic and Extrinsic Properties Governs Courts' Decisions During Thing Construction*

Reinforced by the intuitively palatable oppositions of duplicates versus indiscernibles and real change versus mere Cambridge change, the essentialist distinction between the intrinsic and extrinsic properties of a thing may influence how judges define thing-types. A reasonable hypothesis is that the distinction serves as an extra-legal, conventional restriction that fills the gap left by a lack of explicit statutory guidance and effectively binds patent courts during thing construction.¹¹⁹

Because AAT is readily defined in terms of new properties for preexisting things,¹²⁰ the distinction between intrinsic and extrinsic properties suggests that there are two categories of AAT. On the one hand, there is intrinsic-property AAT—AAT that results from the invention of a new intrinsic property for the already disclosed and claimed thing. Paper with the property *being dyed green with an after-arising chemical* is most intuitively viewed as an intrinsic property, at least provided that the dye is

¹¹⁶ CHARLES, *supra* note 113, at 5–11 (describing a form of “modern essentialism” associated with the work of Hilary Putnam).

¹¹⁷ See Dunn, *supra* note 112, at 180 (noting that the precise mass and charge of a particle are intrinsic qualities).

¹¹⁸ This, of course, is not the only authority to which deference could be paid to establish what things are intrinsically. Although the result would not correspond as closely with widely shared intuitions about the world, the views of a cultural anthropologist could be substituted for the views of the physicist to arrive at a radically different set of intrinsic properties. Cf. BRUNO LATOUR, REASSEMBLING THE SOCIAL: AN INTRODUCTION TO ACTOR-NETWORK-THEORY 63–86 (2005) (developing an understanding of objects that attributes agency to objects).

¹¹⁹ Importantly, it is not necessary to accept the distinction between intrinsic and extrinsic properties as a matter of metaphysics to defend the thesis that the distinction between intrinsic and extrinsic properties is useful as a descriptive tool with explanatory purchase in the task of figuring out what courts do. Rather, the strong metaphysical claim about intrinsic properties advocated by philosophers can be relaxed into a weaker claim about shared intuitions and convention. So long as the intuitions about duplicates and mere Cambridge change, *see supra* text accompanying notes 104–09 (explaining these intuitions), that are derived from the scientific, physical essentialism are real in the minds of judges and patent litigants, the impact of the distinction between intrinsic and extrinsic properties on how courts construct things can be real. Using the terms suggested by Mike Madison, the stronger claim that courts construct “things by nature” can be translated into a weaker claim that they construct “things by practice.” *See infra* note 239 and accompanying text.

¹²⁰ *See supra* text accompanying notes 86–89 (defining AAT in terms of after-arising properties for preexisting things).

not merely a superficial coating but instead alters the molecular bonds within the paper. Two objects with different internal molecular structures are not truly duplicates;¹²¹ the change that a sheet of paper undergoes when its molecular structure is altered is real change.¹²² On the other hand, there is extrinsic-property AAT—AAT that results from the invention of a new extrinsic property for the already disclosed and claimed thing. The allegedly infringing sheet of paper with the after-arising property *being in the paper-tray of an after-arising computer printer* is most intuitively viewed as extrinsic-property AAT with respect to the disclosure of the earlier patent claiming “paper.” The generic property *being contained within something else* is not entirely about the disclosed sheets of paper; it depends, wholly or partly, on something other than the thing to which the property is ascribed, namely a printer.¹²³ A sheet of paper in a paper tray is readily viewed as a duplicate of a sheet of paper outside of the paper tray;¹²⁴ the change involved in putting the sheet of paper into the paper tray seems like mere Cambridge change rather than real change.¹²⁵

If judges are constrained by the distinction between the intrinsic and extrinsic properties of a thing during thing construction, one would expect them, in turn, to make a distinction, whether consciously or not, between intrinsic- and extrinsic-property AAT in cases addressing the reach of literal claim scope into after-arising technology.¹²⁶

In cases involving allegations of literal infringement of intrinsic-property AAT, courts would never side with the patent owner. Intrinsic-property AAT, such as the paper that is chemically altered when it is dyed green with an after-arising chemical, represents a newly discovered thing-type. The property that makes the AAT after-arising is an intrinsic property, and intrinsic properties are those that by definition contribute to the definition of a thing-type. If a claim is to encompass intrinsic-property AAT, its thing-scope must expand over time. On the date of infringement, there is a thing within the scope of the claim that is not a duplicate of any thing that was within the scope of the claim at the time of filing. Building on the notion that real change would occur if a thing within the patent’s constructive disclosure were to turn into intrinsic-property AAT, the growth after the date of filing that the claim must undergo in order to bring

¹²¹ See *supra* text accompanying notes 104–06 (contrasting duplicates with indiscernibles).

¹²² See *supra* text accompanying notes 107–09 (contrasting real change with mere Cambridge change).

¹²³ See *supra* text accompanying note 97 (defining extrinsic properties).

¹²⁴ See *supra* text accompanying notes 104–06 (contrasting duplicates with indiscernibles).

¹²⁵ See *supra* text accompanying notes 107–09 (contrasting real change with mere Cambridge change).

¹²⁶ The discussion in the remainder of this subsection presumes that courts employ the fixation theory for thing-scope. If courts were to adopt the growth theory for thing-scope, thing construction might not be dispositive of the outcomes in cases involving the reach of literal claim scope into AAT. See *supra* note 81.

intrinsic-property AAT within its ambit can be thought of as *real growth*. In theory, intrinsic-property AAT forces courts to choose either the fixation theory or the growth theory for thing-scope. If the fixation theory prevails and the commensurability requirements of the disclosure doctrines require that thing-scope is fixed on the date a claim is filed, the real growth in thing-scope required for literal infringement is doctrinally impossible.

In contrast, in cases involving allegations of literal infringement of extrinsic-property AAT, courts would always side with the patent owner. Extrinsic-property AAT is a token of a thing-type disclosed in the patent specification at the time of filing, albeit a token that is discernable from the disclosed things. The property that makes the AAT after-arising is a property that is overlooked in the definition of thing-types. The thing-scope of a claim therefore need not expand after the filing date in order to be able to encompass newly discovered extrinsic-property AAT. On the date of infringement, the coarse-grained nature of thing-types means that there are no new things within the scope of the claim. The extrinsic-property AAT is simply viewed as a duplicate of one of the things that was within the scope of the claim at the time of filing. Building on the notion that mere Cambridge change would occur if a thing constructively disclosed by the patent specification were to turn into extrinsic-property AAT, the growth after the date of filing that the claim must undergo in order to bring extrinsic-property AAT within its ambit can be thought of as *mere Cambridge growth*. Such mere Cambridge growth is doctrinally permissible even if the commensurability requirements of the disclosure doctrines require that thing-scope is fixed on the date a claim is filed. Thus, in theory, extrinsic-property AAT represents a type of AAT for which the fixation-growth paradox can be explained without contradiction.

3. *Testing the Hypothesis: The Reach of Literal Claim Scope into Intrinsic- and Extrinsic-Property AAT*

The hypothesis put forward in the previous subsection is that courts might use the essentialist distinction between intrinsic and extrinsic properties to identify the properties that do and do not, respectively, define thing-types during thing construction. If the distinction governed courts' decisions during thing construction, one would expect bifurcated case law concerning the reach of literal claim scope into AAT. The inclusion of extrinsic-property AAT within a literal claim would generate only mere Cambridge growth in thing-scope. Courts would therefore sanction the reach of literal thing-scope into extrinsic-property AAT without recognizing any legally relevant growth in thing-scope, i.e. even while embracing the fixation theory. However, the inclusion of intrinsic-property AAT within a literal claim would generate real growth in thing-scope. In this situation, thing construction would not mask the growth, and courts would be forced to either reach a verdict of noninfringement or

abandon the *ex ante* fixation of thing-scope. In other words, extrinsic-property AAT would result in a solution that sanctions both fixation and growth simultaneously, but intrinsic-property AAT would force courts to elect one of the incompatible fixation and growth theories.

This subsection tests the hypothesis by comparing the Federal Circuit case law on the reach of literal claim scope into AAT with the case law that one would expect to result from courts' adherence to the distinction between intrinsic and extrinsic properties during thing construction. The comparison supports the conclusion that the hypothesis is at least half correct, and perhaps more than that. On the one hand, extrinsic-property AAT always falls within the literal scope of a claim.¹²⁷ Furthermore, courts and commentators never suggest that the claim's thing-scope grows after the date of filing when it encompasses extrinsic-property AAT. On the other hand, courts do not treat intrinsic-property AAT in a uniform manner. They sanction the reach of literal claim scope into intrinsic-property AAT in some instances, but not in others; they express concerns about *ex post* growth when literal claim scope reaches into intrinsic-property AAT in some instances, but not in others. Whether the structural essentialism that underlies the distinction between intrinsic and extrinsic properties is dispositive in thing construction in cases involving intrinsic-property AAT remains an open question.

a. Literal Claims Always Encompass Extrinsic-Property AAT

There are three recurring scenarios in which an improver N+1 invents a new extrinsic property for a thing already invented, disclosed, and claimed by an original inventor N: claims to combinations, new methods of making a claimed thing, and new methods of using a claimed thing. In each scenario, courts always and without exception allow N's claim to encompass N+1's extrinsic-property AAT without even addressing the argument that the inclusion of such AAT within literal claim scope impermissibly expands the claim after the date of filing and violates the commensurateness requirement in the disclosure doctrines. In other words, the fixation theory never stands in the way of courts' inclusion of extrinsic-property AAT within literal claim scope.

After-arising combinations are the stuff of black letter law and introductory patent courses. An inventor N invents and claims "the invention comprising A," and an improver N+1 invents the after-arising combination A+B (which can be after-arising either because B is itself after-arising or because the combination of A and B is after-arising).¹²⁸

¹²⁷ *But cf. infra* note 135 (noting that a property that is conventionally viewed as an extrinsic property becomes an intrinsic property when a claim limitation expressly recites the property).

¹²⁸ N+1 can file either of two claims. If she files a claim to the combination A+B, she generates a physical blocking patent; if she files a claim only to B (assuming that B itself is the invention), she

N's claim always reads on N+1's AAT; the presence of an "additional element," B, in an accused device never negates the fact that N+1's device infringes N's claim.¹²⁹ Another way of framing what occurs when N+1 invents an after-arising combination is to note that N+1 has invented an after-arising extrinsic property for the thing invented, disclosed and claimed by N: N+1 has inventively attributed to the thing A the after-arising property *being used in combination with B*. This is an archetypal extrinsic property because A is the thing described by N's claim and N+1's invention specifies a relationship between A and B, a clearly distinct thing. The rule that N+1's after-arising A+B always infringes N's claim to "the invention comprising A" suggests that courts always overlook this extrinsic, relational property in determining the identity of the thing-types that comprise thing-scope. Courts never pause to consider whether N's claim is no longer commensurate with the disclosure at the time of filing when N's claim grows in this fashion.

The same doctrine that applies to after-arising combinations also applies to after-arising methods of making and using claimed things. When N+1 invents a new method of making a thing previously invented, disclosed, and claimed by N, N's claim always, without exception, reads on the things made using N+1's after-arising process without running afoul of the commensurateness requirement.¹³⁰ Here, N+1 makes a thing with the same intrinsic properties as the thing made by N but with a new extrinsic property—the property *having been made by such-and-such an after-arising process*.¹³¹ Similarly, when N+1 invents a new method of using a thing with all of the same intrinsic properties as a thing previously invented by N, N's claim can also always read on N+1's AAT without raising a commensurateness problem.¹³² The property *being used for such-and-such a purpose* is an extrinsic property. Two structurally identical

generates an economic blocking patent because she describes a physically distinct economic complement. See *supra* note 66 (defining physical and economic blocking patents). However, the effect of the physical and economic blocking patents on the expansion of the thing-scope of N's claim is identical. In both instances, the thing-scope of N's claim to A includes at the time of infringement the thing A with the after-arising property *being present in combination with B*.

¹²⁹ Cf. *A.B. Dick Co. v. Burroughs Corp.*, 713 F.2d 700, 703 (Fed. Cir. 1983) ("[A] pencil structurally infringing a patent claim would not become noninfringing when incorporated into a complex machine that limits or controls what the pencil can write.")

¹³⁰ See *Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1330–33 (Fed. Cir. 2003) (noting this rule in the written description requirement); *id.* at 1334–35 (noting this rule in the enablement requirement); cf. *Vanguard Prods. Corp. v. Parker Hannifin Corp.*, 234 F.3d 1370, 1372–73 (Fed. Cir. 2000) (noting that the fixed meaning-scope of literal claims encompasses things made by after-arising processes).

¹³¹ It is not absurd to talk about the property *being made by a particular process* as a property. Cf. CRUSE, *supra* note 26, at 118–19 (arguing that "seeing something from the point of view of its origins" is a distinct perspective on the world).

¹³² See *B.G. Corp. v. Walter Kidde & Co.*, 79 F.2d 20, 22 (2d Cir. 1935) (holding that a claim to an improved sparkplug reads on sparkplugs used in airplanes that were developed after the sparkplug claim had been filed).

molecules of chemical X are treated as duplicates even if they are being put to different uses. The fact that the useful functions of a thing-token are extrinsic properties also explains why a species that is patentable over an already issued genus claim because of the discovery of an unexpected use for the species routinely falls within the scope of the genus claim without causing an outcry that the genus claim is somehow expanded by the inclusion of AAT.¹³³ The species claimant has merely discovered a nonobvious, extrinsic property of the already invented, disclosed and claimed object.

Thus, at least with respect to extrinsic-property AAT, the hypothesis that the distinction between intrinsic and extrinsic properties governs courts' decisions during thing construction is consistent with the Federal Circuit's case law on the reach of literal claim scope into AAT. The *per se* inclusion of extrinsic-property AAT within literal claim scope suggests that courts performing thing construction in these cases are firmly under the sway of a structural essentialism pertaining to the nature of what things are.¹³⁴ Courts seem to view things as being defined by their internal structures and nothing more. Extrinsic properties do not appear to contribute to the identity of thing-types; courts never seem to divide what they intuitively perceive to be a unitary thing-type into distinct thing-types with reference to extrinsic properties.¹³⁵ Things that are after-arising only in the sense that they have after-arising extrinsic properties are readily viewed as duplicates of the things in existence at the time of filing.

¹³³ See, e.g., *Rohm & Haas Co. v. Dawson Chem. Co.*, 557 F. Supp. 739, 806 (S.D. Tex. 1983), *rev'd on other grounds sub nom. Rohm & Haas Co. v. Crystal Chem. Co.*, 722 F.2d 1556 (Fed. Cir. 1983) ("A subsequent species invention, even if unobvious and hence patentable over an earlier generic invention, . . . does not require restriction of the literal scope of claims to the generic invention so as to exclude the later species.").

¹³⁴ See *supra* text accompanying notes 116–18 (noting that the distinction between the intrinsic and extrinsic properties of a thing rests on a structural or physical essentialism).

¹³⁵ There is an exception to this rule. Properties that are conventionally viewed as extrinsic become relevant when the conventional framing of the things in question is narrowed by the claim language. A conventionally extrinsic property can become intrinsic by expressly reframing the amount of stuff that comprises the thing. See *supra* text accompanying note 115 (noting that the physical framing of the thing in question can affect whether a property is intrinsic or extrinsic). Properties that are by convention extrinsic can be made intrinsic and relevant to both meaning-scope and the identity of things if they are expressly listed as limitations in the text of the claim. If a patent simply claims "paper," then the property *being in a computer printer paper tray* is an extrinsic property of the claimed paper. However, if the patent claims more specifically "paper in a computer printer paper tray," then the property *being in a computer printer paper tray* is an intrinsic property of the claimed things because the things under consideration are paper/printer-tray pairings. Similarly, a product-by-process claim can transform the conventionally extrinsic property *having been made by such-and-such a process* into one that matters to thing-scope. See *Atlantic Thermoplastics Co. v. Faytex Corp.*, 970 F.2d 834, 846–47 (Fed. Cir. 1992) ("[P]rocess terms in product-by-process claims serve as limitations in determining infringement."). But see *Scripps Clinic & Research Found. v. Genentech, Inc.*, 927 F.2d 1565, 1583 (Fed. Cir. 1991) ("[T]he correct reading of product-by-process claims is that they are not limited to product prepared by the process set forth in the claims."). In the same vein, the function of an object is not extrinsic to the things described by a claim reciting the object being used in a particular fashion.

Growth in the number of extrinsic properties that things described by the claim possess is not understood to trigger an expansion in the metric of thing-scope relevant to the commensurability analyses of the disclosure doctrines. The post-filing growth in thing-scope that does occur when a claim encompasses extrinsic-property AAT is dismissed as mere Cambridge growth.

Of course, the fact that courts routinely allow extrinsic-property AAT to fall within literal claim scope does not definitively prove that courts overlook the extrinsic properties of a thing during thing construction. The use of the growth theory is also consistent with the holdings in cases involving extrinsic-property AAT. However, the growth theory does not fit well with the way in which these cases are most commonly understood. Claims to combinations, new methods of making a claimed thing, and new methods of using a claimed thing are viewed as making the things described by a claim more valuable, but they are not viewed as increasing the number of things described. It is commonly believed that literal claims can encompass extrinsic-property AAT without undergoing any growth in thing-scope.¹³⁶

b. *Literal Claims Sometimes Exclude Intrinsic-Property AAT*

There is no symmetry between the holdings of cases involving extrinsic-property AAT and the holdings of cases involving intrinsic-property AAT. Courts do not have a *per se* rule of exclusion that prevents literal claim scope from reaching into intrinsic-property AAT. Rather, the cases in which courts confront allegedly infringing intrinsic-property AAT are a mixed bag.

Adhering to the fixation theory, some courts hold that literal claim scope cannot encompass intrinsic-property AAT as a matter of law because the commensurability requirement of the disclosure doctrines fixes claim scope on the date of filing and the growth required for claim scope to encompass the AAT is incompatible with this fixation.¹³⁷ Yet, not all courts insist that intrinsic-property AAT does not literally infringe. Many courts conclude that literal claim scope can encompass intrinsic-property AAT. Abandoning the fixation theory and applying the growth theory, courts sometimes expressly recognize that inclusion of intrinsic-property AAT within the literal scope of a claim means that the thing-scope of a claim must grow over time. In these cases, courts openly sanction a

¹³⁶ See e.g., Lemley, *supra* note 66, at 1009 (noting that a claim can read on AAT if either (a) “enablement is tested as of the time the original inventor files for a patent” and thus a growth theory is adopted or (b) the AAT “consists of additions to the basic structure” or involves “new and unanticipated uses of [the patented] product”).

¹³⁷ See *supra* note 64 and accompanying text.

growth theory for thing-scope.¹³⁸ However, courts also sometimes allow literal claim scope to encompass intrinsic-property AAT without recognizing that this result requires post-filing growth in thing-scope. For example, consider again the easy cases of infringement outlined in the new-materiality and new-geometry coffee sleeve hypotheticals.¹³⁹ Materiality and internal geometry are core examples of intrinsic properties,¹⁴⁰ so the allegedly infringing technologies are intrinsic-property AAT. It is unclear whether courts believe that a verdict of infringement in these easy cases does not challenge the fixation of the claim's thing-scope on the date of filing or whether courts believe that post-filing growth exists but that such growth is uncontroversial under the growth theory. It is thus unclear whether the distinction between intrinsic and extrinsic properties governs courts' decisions during thing construction in cases involving intrinsic-property AAT.

The diversity in the case law can be explained by either of two stories. The first story presumes that the structural essentialism underlying the distinction between intrinsic and extrinsic properties holds sway during thing construction in intrinsic-property AAT cases just like it does in extrinsic-property AAT cases. In other words, it presumes courts always recognize that inclusion of intrinsic-property AAT within the literal scope of a claim creates real growth in thing-scope and thus unhinges the claim's thing-scope from the thing-scope of the claim on the date of filing. To explain the courts' pattern of sometimes, but not always, sanctioning the reach of literal claim scope into intrinsic-property AAT, this first story relies on the courts oscillating between the fixation and growth theories in their administration of the disclosure doctrines.¹⁴¹ Here, the conventional view that fixation and growth in literal claim scope are incompatible

¹³⁸ See *supra* note 65 and accompanying text. In fact, all of the cases in which courts expressly raise the growth theory as an alternative to the fixation theory are cases involving intrinsic-property AAT. This observation is simply a logical corollary of the point made in the previous subsection, namely that the nature of extrinsic properties as properties not tied up with what makes a thing the thing itself means that courts and commentators do not view fixation and growth as incompatible when extrinsic-property AAT is at issue.

¹³⁹ See *supra* text accompanying notes 72–75.

¹⁴⁰ See *supra* text accompanying notes 94–96 (defining intrinsic properties). Coffee sleeves made of different materials and geometries are not strict duplicates, see *supra* text accompanying notes 104–06 (contrasting duplicates with indiscernibles), and the change required to transform the materiality or shape of a coffee sleeve is real change, see *supra* text accompanying notes 107–09 (contrasting real change with mere Cambridge change).

¹⁴¹ See *supra* notes 64–65 and accompanying text (discussing the conflict between the fixation and growth theories in the disclosure doctrines). Courts' pattern in the intrinsic-property AAT cases may also be influenced by the conflict between the fixation and growth theories in meaning-scope. See *supra* notes 49–61 and accompanying text. Courts may be sanctioning the growth theory as it pertains to thing-scope, but both presuming that growth in thing-scope entails growth in meaning-scope and adhering to a fixation theory as it pertains to meaning-scope. Cf. *infra* Part IV (arguing that the meaning of meaning determines whether the fixation of meaning-scope entails the fixation of thing-scope).

prevails.

In contrast, a second story suggests that courts are not always under the sway of structural essentialism during thing construction and that they use some other principle to set the granularity of things. Perhaps judges do not always feel bound to make all of the intrinsic properties of a thing relevant to the identity of a thing-type. Courts may overlook selected intrinsic properties during thing construction and thereby sanction the reach of a claim with a fixed thing-scope into intrinsic-property AAT. Courts may treat a property that should be intrinsic-property AAT in an essentialist worldview as though it were extrinsic-property AAT. That is, they may generate a category of ersatz extrinsic-property AAT, placing tokens of things with distinct intrinsic properties into the same conceptual thing-type basket. This second story suggests that courts use a one-way ratchet to adjust the granularity of things away from its essentialist mooring during thing construction: the existence of ersatz extrinsic properties means that thing-types can be coarser than the distinction between intrinsic and extrinsic properties suggests they should be, but the absence of ersatz intrinsic properties means that thing-types cannot be made finer than the distinction suggests. This story also offers a both-and solution, explaining how courts can transform what should be real growth in thing-scope into mere Cambridge growth so as to achieve both the *ex ante* fixation of thing-scope and the inclusion of intrinsic-property AAT within the scope of a literal claim.

Clearly, it is impossible to know for certain which of these stories explains the mixed bag of holdings and rationales in cases involving allegations that literal claim scope reaches into intrinsic-property AAT.¹⁴² If a court has a sense of what the outcome of a case should be, the court can either oscillate between the fixation and growth theories or generate ersatz extrinsic-properties to achieve the desired outcome.¹⁴³ Given the dominance of the fixation and growth theories in contemporary discourse about patent protection,¹⁴⁴ the only point that can be made here is that the option of policy-driven ersatz extrinsic properties should not be categorically disregarded. Courts may use thing construction as a policy lever.¹⁴⁵ They may ratchet down the granularity of things from the essentialist mooring provided by the distinction between intrinsic and

¹⁴² A thesis about which of these two stories is descriptively more accurate would require at least a more detailed descriptive analysis of case law and most likely an entirely different type of analysis aimed at understanding the unexpressed cognitive processes of judges.

¹⁴³ Another way of stating this fact is that the court can use either oscillation between the fixation and growth theories or thing construction as a policy lever. See Burk & Lemley, *Policy Levers*, *supra* note 16, at 1640 (noting a court's discretion to use doctrinal policy levers).

¹⁴⁴ See *supra* text accompanying notes 3–11 (introducing the dominant growth and fixation theories).

¹⁴⁵ See Burk & Lemley, *Policy Levers*, *supra* note 16, at 1640 (noting a court's discretion to use doctrinal policy levers).

extrinsic properties so as to achieve a both-and solution to the fixation-growth paradox and shape the reach of literal claim scope into intrinsic-property AAT.

In fact, the notion that courts generate ersatz extrinsic properties and treat real growth in thing-scope as though it were mere Cambridge growth is arguably better at explaining intuitions about patent protection in at least some situations in which literal claim scope reaches into intrinsic-property AAT. For example, consider again the hypothetical claim to “paper” and an allegedly infringing sheet of paper with the property *being dyed with after-arising chemical X*.¹⁴⁶ Consider two variants of this hypothetical: one in which the after-arising chemical alters the chemical structure of the paper, incorporating itself into the molecular structure of the paper’s fibers, and one in which the after-arising chemical simply coats the exterior of the pre-existing paper. The latter, “coating” variant of the hypothetical is a clear example of extrinsic-property AAT. It is akin to the type of AAT generated by a combination claim: the AAT is simply the same old paper disclosed in the specification of the patent claiming “paper” that has been put into a new relation with a later-developed technology. Its inclusion in the claim to “paper” generates only mere Cambridge growth in thing-scope, and such growth is always masked through thing construction. In contrast, the former, “chemically integral” variant is a clear example of intrinsic-property AAT. According to a worldview dominated by structural essentialism, the AAT is a thing that is distinct from the things disclosed in the patent claiming “paper.” Yet, despite the fact that the former is extrinsic-property AAT and the latter is intrinsic-property AAT, courts may not make a sharp conceptual distinction between the two variants. To the extent that the difference between the two variants is viewed as insubstantial, the case for believing that courts do sometimes use ersatz extrinsic-property AAT becomes stronger. Sometimes, what things are structurally does not seem to matter. This perception suggests that thing construction is not always governed by the distinction between intrinsic and extrinsic properties and that thing construction is at least sometimes used as a policy lever for adjusting the granularity of things and shaping the reach of literal claim scope into AAT.

IV. THE MEANING OF MEANING

The previous Part demonstrated how courts can construct things so as to fix thing-scope on the date of filing and still allow literal claims to grow after filing so as to encompass AAT. This Part explores a second, and analytically independent, mechanism through which courts can achieve a both-and solution of fixation and growth. By adopting the appropriate

¹⁴⁶ See *supra* text accompanying notes 84, 90, 126.

definition for meaning, courts can sanction play between thing-scope and meaning-scope: even if the thing-scope of a claim grows after the date of filing, meaning-scope may remain fixed on the date of filing.¹⁴⁷

Part IV.A demonstrates that the meaning of meaning is ambiguous. Denotational meaning, or reference, derives from relationships between words and things in the world, whereas ideational meaning, or sense, derives from relationships between words.¹⁴⁸ Part IV.B demonstrates the practical implications of this ambiguity. The court's choice of how to define the meaning of meaning in claim construction determines whether a claim with a meaning-scope fixed on the date of filing can literally encompass AAT that expands the claim's thing-scope. Because denotational meaning links words to things, courts that stabilize denotational meaning on the date of filing necessarily stabilize both meaning-scope and thing-scope on the date of filing in the same fell swoop. Denotational meaning forces courts to adopt either the fixation theory or the growth theory: if AAT requires a post-filing expansion in thing-scope to infringe, either the AAT cannot literally infringe (i.e. fixation trumps) or the meaning of the claim cannot be fixed on the date of filing (i.e. growth trumps). However, a court that stabilizes ideational meaning on the date of filing can reach a both-and solution. Ideational meaning fixes only word-to-word relationships and thus sanctions play between the meaning-scope and thing-scope of a claim. Ideationally defined meaning-scope can remain steadfastly fixed on the date of filing, even as thing-scope expands over time to encompass AAT. Part IV.C concludes with a brief overview of the situations in which courts actually use ideational and denotational meaning in claim construction.

¹⁴⁷ Thing construction and the meaning of meaning are analytically independent mechanisms for resolving the fixation-growth paradox without logical contradiction. The previous Part demonstrated that thing construction achieves this end by masking growth in thing-scope. Extrinsic-property AAT, both essential and ersatz, can fall within the literal scope of a claim because the mere Cambridge growth in thing-scope that such AAT triggers upon its inclusion simply does not expand the claim's thing-scope when measured with the legally sanctioned metric for a thing-type. See generally *supra* Part III. This Part investigates a distinct and logically subsequent question. It assumes that the inclusion of AAT within the scope of a literal claim expands thing-scope; it assumes that thing construction has not been used to achieve a result of simultaneous fixation and growth. Starting from this point, it queries whether the expansion of thing-scope entails the expansion of meaning-scope or whether alternatively meaning-scope can remain fixed even as thing-scope expands.

¹⁴⁸ Margaret Radin's work demonstrates that patent lawyers can gain insight by bringing the philosophy of language to bear on the mechanics of peripheral claims. Margaret Jane Radin, *The Linguistic Turn in Patent Law* (2005) (draft on file with *Connecticut Law Review*) (juxtaposing basic patent issues with basic issues in the philosophy of language); see also Craig Allen Nard, *A Theory of Claim Interpretation*, 14 HARV. J.L. & TECH. 1, 50-52 (2000) (invoking Wittgenstein's views of language as an activity that is performed in a community to argue against a "hypertextualist" theory of claim construction); Kristen Osenga, *Linguistics and Patent Claim Construction*, 38 RUTGERS L.J. 61, 83-105 (2006) (advocating a "linguistics-based approach to claim construction"). However, the ambiguity in the meaning of meaning discussed in this Part is new to the patent literature.

A. *The Ambiguity in the Meaning of Meaning*

Over a decade ago in *Markman v. Westview Instruments, Inc.*, the U.S. Supreme Court identified two steps within the process of determining whether the language of a patent claim describes a thing-token, and it assigned each step to a different party.¹⁴⁹ It assigned claim construction, the interpretation of the word meaning of the language, to judges, and it reserved infringement, or the determination of whether the meaning of the language encompasses the allegedly infringing things, for the jury.¹⁵⁰ With the power to perform claim construction in the hands of the judges, patent courts and commentators have understandably focused, ever since *Markman*, on identifying an appropriate methodology for claim construction. In large part, this question has led to a heated battle over the relative importance of the contextual use of words in patent specifications and the words' dictionary definitions.¹⁵¹

The question that this subsection addresses and that courts face when defining the meaning of meaning is not this common question.¹⁵² Here, meaning is not dealt with as a noun in the sense of the generality or specificity of the semantic content of a particular word or phrase. Rather, it is the nature of meaning as a verb that is at issue. The question is not what descriptive language means but how it means. How does a claim term achieve semantic content? This subsection argues that the meaning of meaning in this verbal form is ambiguous. Denotational and ideational theories of meaning—alternatively described as reference and sense, respectively—both offer plausible interpretations of the mechanism through which descriptive language achieves meaning.¹⁵³

¹⁴⁹ *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 384 (1996).

¹⁵⁰ *Id.* at 384, 391.

¹⁵¹ The Federal Circuit confronted this issue head-on in *Phillips v. AWH Corp.*, but *Phillips* did not eliminate the confusion. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1310 (Fed. Cir. 2005). For an empirical take on this methodological question before *Phillips*, see generally Wagner & Petherbridge, *supra* note 24.

¹⁵² However, the relative weight afforded to the specification and dictionaries can also influence the reach of literal claim scope into AAT. See, e.g., *Superguide Corp. v. DirecTV Enter., Inc.*, 358 F.3d 870, 896–98 (Fed. Cir. 2004) (Michel, J., concurring) (arguing in favor of a denotational claim construction in part because “the preferred, proper sources of interpretation [are] the disclosure, technical dictionaries, prior art patents, and expert testimony” and the disclosure necessarily only conveys possible things accessible to the PHOSITA at the time of filing). The definition of meaning addressed here is also distinct from the construction required to determine the size of the “chunk” of text of a patent claim that should constitute a single limitation. See generally Dan L. Burk & Mark A. Lemley, *Quantum Patent Mechanics*, 9 LEWIS & CLARK L. REV. 29, 41–46 (2005).

¹⁵³ Variations on this distinction have a long and pedigreed history that is generally traced to Gottlob Frege's 1892 essay *On Sense and Reference*. TRANSLATIONS FROM THE PHILOSOPHICAL WRITINGS OF GOTTLLOB FREGE 56 (Peter Geach & Max Black eds., 1952). However, the linguistic and philosophical terminology used in this Article is not used by all scholars of language in the same way. Cf. MICHAEL DEVITT & KIM STERELNY, LANGUAGE AND REALITY: AN INTRODUCTION TO THE PHILOSOPHY OF LANGUAGE 34 (1987) (“One should be on the lookout for different technical usages among semanticists.”); JOHN LYONS, LINGUISTIC SEMANTICS: AN INTRODUCTION 7–8 (1995) (discussing the regimentation and extension of meaning in linguistic metalanguage). There is no

1. Denotational Meaning

A denotational theory of meaning posits that descriptive word meanings follow from a relationship between a word and the objects or actions that the word describes. Denotationally speaking, words “can be readily defined by identifying what they stand for” in the world.¹⁵⁴ Denotational meaning is often used interchangeably with the notion of reference. Reference is the link between language, our medium of communication, and the objective world, that about which communication occurs.¹⁵⁵ “Reference is concerned with designating entities in the world by linguistic means.”¹⁵⁶ (To mimic the language commonly employed to claim mechanical inventions in patent practice, “the distal term of the relation of reference”¹⁵⁷ is an object, and the proximal term is language.) From the perspective of a scholar of language, reference addresses “how language ‘hooks on to’ the extralinguistic world.”¹⁵⁸ In sum, a descriptive expression achieves denotational meaning because it refers to a generic class of objects or a set of thing-types.¹⁵⁹

In the terminology of logic, a follower of a denotational theory of meaning believes that words stand for the term’s extension, that is, the class of objects to which the term applies.¹⁶⁰ The extension of a term is “[i]ts range as measured by the number of objects which it . . . contains under it.”¹⁶¹ To adopt an extensional approach to meaning is “to attempt to correlate expressions in language with aspects of the world.”¹⁶²

Although intuitive in its go-for-the-jugular approach to meaning, an advocate of a strictly denotational theory of meaning that localizes meaning in the link between descriptive words and real-world objects must grapple with a problem arising from the empirically limited number of objects that exist in the world around us. There is the problem of empty

universal lexicon for discussing the meaning of meaning.

¹⁵⁴ LYONS, *supra* note 153, at 75.

¹⁵⁵ Some linguists distinguish reference and denotation to allow the former to address the “utterance-dependent” part of an expression’s meaning. See LYONS, *supra* note 153, at 79; cf. DEVITT & STERELNY, *supra* note 153, at 34 (noting different uses of the term ‘refer’ among British and American philosophers).

¹⁵⁶ CRUSE, *supra* note 26, at 305. A more cautious theory of reference questions the mind’s access to an “objective world” independent from language-based conceptual structures. *Id.* at 306; DEVITT & STERELNY, *supra* note 153, at 199–200; cf. LYONS, *supra* note 153, at 324–25 (discussing “the viewpoint of naive realism, according to which the ontological structure of the world is objectively independent both of perception and cognition and also of language . . .”).

¹⁵⁷ CRUSE, *supra* note 26, at 306.

¹⁵⁸ *Id.* at 301; LYONS, *supra* note 153, at 76.

¹⁵⁹ Patent claims use language to achieve generic reference, or reference to a class of objects, rather than definite or indefinite reference to a particular object in the class. See CRUSE, *supra* note 26, at 306–12 (distinguishing definite, indefinite, and generic reference).

¹⁶⁰ K. CODELL CARTER, A FIRST COURSE IN LOGIC 71 (2004); CRUSE, *supra* note 26, at 21–22; LYONS, *supra* note 153, at 301.

¹⁶¹ 5 OXFORD ENGLISH DICTIONARY 597 (2d ed. 1989) (definition 8b).

¹⁶² CRUSE, *supra* note 26, at 21.

terms.¹⁶³ Many descriptive words and phrases have meaning, yet there are no objects in the tangible world to which they connect. “Unicorn” is not a meaningless term. Yet, if extension in the world around us were equated with meaning through reference, the meaningfulness of “unicorn” would be in jeopardy because it cannot obtain its meaning by standing for an object in our world. There is also the problem of terms that refer to coextensive sets of objects but that do not always have interchangeable meanings. If the extension of a descriptive word in the actual world is the sole determinate of meaning and two terms refer to the same objects, explanations of why the two terms that refer to coextensive sets of objects are not completely interchangeable are difficult to come by. For example, “[t]he property of being human and the property of being a featherless biped have (we may presume) the same extension, yet they are distinct properties.”¹⁶⁴

To address these problems, some proponents of denotation and reference as the locus of descriptive meaning “enrich ontology (our view of the sorts of things that exist)” and introduce the notion of possible worlds.¹⁶⁵ According to possible-world theorists, speakers inhabit the actual world, but worlds other than this actual world may be at the distal end of reference. “We begin with the idea of the totality of the possible worlds across which all of the genuine possibilities . . . are represented. One of these possible worlds—the actual world—is special, closer to our hearts and distinguished somehow from the others that are ‘merely’ possible.”¹⁶⁶ The meaning of a generic descriptive expression is then achieved by quantifying over all possible worlds and identifying the set of objects to which the word refers in our actual world and other possible worlds as well. “The simplest plan is to take a property just as the set of all its instances—all of them, this- or other-worldly alike. Thus the property of being a donkey comes out as the set of all donkeys, the donkeys of other worlds along with the donkeys of ours.”¹⁶⁷ Thus, the word “unicorn” has

¹⁶³ See, e.g., DEVITT & STERELNY, *supra* note 153, at 27–28 (discussing the term “James Bond” as an “empty name” that does not have a real-world referent).

¹⁶⁴ JOHN DIVERS, POSSIBLE WORLDS 9–10 (2002); see also LEWIS, *supra* note 106, at 50 (noting that the property of having a heart and having a kidney are different properties although both properties refer to the same set of creatures in our world); LYONS, *supra* note 153, at 300–01 (discussing referential opacity).

¹⁶⁵ DEVITT & STERELNY, *supra* note 153, at 30–32; see also LYONS, *supra* note 153, at 230–31 (presenting “possible worlds” as a useful concept for dealing with the problems created by referential opacity and terms that do not denote anything). Systems of thought employing *possibilia* may involve either the quantification of possibilities over entire worlds or the quantification over possible individuals in a world. See LEWIS, *supra* note 106, at 8 (“As other worlds are alternative possibilities for an entire world, so the parts of other worlds are alternative possibilities for lesser individuals.”). This Article uses the rhetoric of possible worlds and individuals/objects interchangeably.

¹⁶⁶ DIVERS, *supra* note 164, at 5.

¹⁶⁷ LEWIS, *supra* note 106, at 50–51; see also DIVERS, *supra* note 164, at 32 (“[Possible-world discourse] may be applied to serve . . . the aim of *ontological identification* in which [it] articulates the identification of some familiar kind of entity as a certain kind of construct out of possible worlds.”); *id.*

meaning because unicorns do exist at some non-actual, possible worlds, and “divergence in the extension at some possible world—where there are featherless bipeds that are not human—ensures that being human is not the same property as being a featherless biped.”¹⁶⁸ In sum, denotational meaning is a set-theoretical construction comprised of possible things, both this-worldly and other-worldly.

2. Ideational Meaning

Where denotation lodges the mechanism of meaning in a link between words and things beyond the realm of linguistics, sense posits that meaning is first and foremost an affair of the human mind.¹⁶⁹ Sense supports an ideational or mentalistic theory of meaning—one proposing that “the meaning of an expression is the idea, or concept, associated with it in the mind of anyone who knows and understands the expression”—rather than the referential or denotational theory discussed previously—one proposing that “the meaning of an expression is what it refers to . . . or stands for.”¹⁷⁰

Where denotation involves “word-to-world” links, sense involves “word-to-word” links.¹⁷¹ The ideational meaning of an expression is determined by the links the expression has with one or more other expressions “in a complex multi-dimensional network.”¹⁷² The links specify different relations such as “is a kind of, is a part of, [or] is used for” between the expressions at the nodes.¹⁷³ For example, the node “bachelor” is defined by a relationship of hyponymy—or entailment—with the nodes “unmarried,” “adult,” and “man,”¹⁷⁴ and “red” is defined in part by a relationship of incompatibility with “blue.”¹⁷⁵ Sense is sometimes thought of as dictionary meaning because dictionaries define words by specifying their relationships to other words.¹⁷⁶

at 51 (“The properties . . . are all and only the subsets of the set of all individuals.”).

¹⁶⁸ DIVERS, *supra* note 164, at 10. This still leaves the problem of words that are different in important ways yet that describe coextensive sets in all possible worlds, like “triangular” and “trilateral.” Because the economic effect of patent law depends entirely on thing-scope at the end of the day, *see supra* text accompanying note 30, this problem is not a pressing one here.

¹⁶⁹ *See* CRUSE, *supra* note 26, at 22 (depicting intensional meaning as a mental representation).

¹⁷⁰ LYONS, *supra* note 153, at 40.

¹⁷¹ *Id.* at 101.

¹⁷² CRUSE, *supra* note 26, at 127; *see also* LYONS, *supra* note 153, at 80 (“The sense of an expression may be defined as the set, or network, of sense-relations that hold between it and other expressions of the same language.”). A modified formulation of sense locates the meaning-giving relationships not between words but between concepts. *See* CRUSE, *supra* note 26, at 127–29 (discussing word-concept mapping). Although the difference between the expression- and concept-based approaches to sense has important implications for the relationship between language and thought, it is not relevant to the reach of literal claim scope into AAT.

¹⁷³ CRUSE, *supra* note 26, at 127.

¹⁷⁴ LYONS, *supra* note 153, at 125–26, 128; *see also* CRUSE, *supra* note 26, at 150–51 (noting that “apple is a hyponym of fruit”).

¹⁷⁵ LYONS, *supra* note 153, at 128; *see also* CRUSE, *supra* note 26, at 165 (noting that properties that are incompatibles “cannot be simultaneously present”).

¹⁷⁶ LYONS, *supra* note 153, at 77–78.

Again borrowing from the terminology of logic, sense offers meaning to a term by invoking the term's intension—the set of abstract properties by virtue of which any particular object is placed in the term's extension.¹⁷⁷ In the schema of an ideationalist, properties are not reducible to quantifications over possible worlds. They are abstract entities in their own right that can be subject to independent semantic analysis.

B. *Claim Construction and the Historical Fixation of Meaning-Scope*

In everyday communication, people get by fine with the ambiguity in the meaning of meaning. Both denotation and sense provide passable accounts of how descriptive language operates. “There is not an unfamiliar tradeoff . . . between nonfactual possibles and intensions . . . given either, we may be able to construct the other or to do the work that was supposed to be done by talking about the other.”¹⁷⁸ Nor are the two mutually exclusive. A scholar of sense need not “deny that there are (presumably important) relations between linguistic forms and extralinguistic reality”; she may pragmatically “assum[e] that the most direct connections of linguistic forms . . . are with conceptual structures, and until these are sorted out, there is little hope of making progress with the more indirect links with the outside world.”¹⁷⁹

Claim construction, however, is not everyday communication. Claim construction artificially fixes meaning on the historical date on which a claim is made.¹⁸⁰ This difference from everyday communication transforms the difference between ideational and denotational meaning into a difference that makes a difference in the ability of a claim with a fixed meaning-scope to encompass AAT that must expand thing-scope if it is to infringe.

Fixation of denotational meaning concretizes word-to-world relationships. It defines meaning-scope in terms of thing-scope. Courts fix meaning-scope by fixing the extension of the set of things to which the claim refers. Courts that construe claims denotationally must choose between the fixation and growth theories: either meaning is fixed on the date of filing or meaning can grow in the manner required for a claim to encompass AAT that expands thing-scope.

In contrast, fixation of ideational meaning operates only on a conceptual plane and rigidifies only word-to-word relationships. It fixes only the intension of the set of things that comprises thing-scope or the

¹⁷⁷ CARTER, *supra* note 160, at 71; LYONS, *supra* note 153, at 81; *see also* CRUSE, *supra* note 26, at 22.

¹⁷⁸ Robert Merrihew Adams, *Theories of Actuality*, in *THE POSSIBLE AND THE ACTUAL* 190, 207 (Michael J. Loux ed., 1979).

¹⁷⁹ CRUSE, *supra* note 26, at 127; *see also* DEVITT & STERELNY, *supra* note 153, at 32.

¹⁸⁰ *See supra* text accompanying notes 36–37.

criteria by which inclusion or exclusion from the set is determined. Critically, the fixation of ideational meaning of a claim does not require fixation of the set of things to which the claim refers. Thus, what is at stake in the choice between the fixation of ideational and denotational meaning is the ability of thing-scope to expand along a *progressive dimension* throughout the term of the patent.

1. Denotational Meaning in Claim Construction

Because denotational meaning is based on reference or word-to-world relationships, a court using a denotational theory of meaning in claim construction must identify a set of possible things to which the claim refers in order to give meaning to the claim.¹⁸¹ More specifically, to determine the denotational meaning that the claim language has to the technologically trained and time-bound PHOSITA rather than to someone else, a court must tailor the set to reflect both the PHOSITA's technological training and her position in history.¹⁸² Courts achieve the tailoring required by the technological and temporal biases in different ways.

The PHOSITA's technological bias makes her picky or selective in the set of possible things that she includes in the extension of a descriptive limitation. The PHOSITA sorts through the infinite number of possible thing-types that she can imagine, labeling some as described and thus within the set, and others as not described and thus excluded from the set. For example, to return to the coffee sleeve hypotheticals,¹⁸³ the technological bias suggests that "an insulating band" for the PHOSITA of coffee drinking technology means something different than "an insulating band" does for the PHOSITA of electrical engineering. The coffee drinking PHOSITA would include a commonly available band made from material that is thermally but not electrically insulating, but the PHOSITA of electrical engineering would exclude it.

The temporal bias does not make the PHOSITA picky with respect to the possible things that she consciously decides to either include within or exclude from the claim's extension. Rather, it makes the PHOSITA ignorant of all of the possible things that incorporate AAT and that would, if they were to infringe, expand thing-scope. Because of her ordinariness

¹⁸¹ See *supra* Part IV.A.1 (explaining denotational meaning). Procedurally, a purely denotational theory of meaning is inimical to the U.S. Supreme Court's command in *Markman* that claim construction is in the province of judges but infringement is a task for juries. See *supra* text accompanying notes 149–50. If denotational meaning is a set of possible things, then the determination of meaning entails the determination of infringement. However, courts can avoid this *Markman* problem by implementing a denotational theory of meaning by determining the ideational meaning of the claim and then subtracting any AAT that expands the claim's thing-scope after the date of filing. See *infra* note 193 and accompanying text.

¹⁸² See *supra* text accompanying notes 35–37 (discussing the PHOSITA's technological and temporal biases).

¹⁸³ See *supra* text accompanying notes 72–75.

and average level of creativity, the PHOSITA immersed in a historical context cannot conceive of or imagine such AAT. In possible world discourse, the notion of possible things that lie beyond the grasp of an individual is conveyed through the term of art *accessibility*. Accessibility uses the standpoint of the actual world of a particular speaker or thinker to restrict the set of possible worlds over which the quantification of sets occurs.¹⁸⁴ It has a wide variety of applications, but, as relevant to the task at hand, it is responsible for making people who sort identically to associate different extensions with a claim when they quantify over different sets of possible worlds.¹⁸⁵ The position of the PHOSITA within her own world—the world of the date on which a claim is filed—means that there are possible things that are inaccessible to her yet accessible to today’s PHOSITA. Even though today’s and yesterday’s PHOSITA sort possible things in an identical manner, the two PHOSITAs might reach different denotational meanings because today’s PHOSITA can access, and thus sort through, a larger group of possible worlds and things. To use a common example from patent opinions that discuss AAT, Velcro® is a possible thing that was inaccessible to a PHOSITA in the art of mechanical fasteners prior to its invention.¹⁸⁶ The after-arising coffee sleeves fabricated with nonobvious materials and folded in nonobvious geometries are also, by definition, inaccessible possible things in all of their particularities to the time-bound PHOSITA of coffee sleeves on the date the claim to “paper” is filed.¹⁸⁷

2. Ideational Meaning in Claim Construction

A court using an ideational theory of meaning in claim construction views the claim language as a node in a network of other expressions. To define the meaning of a particular claim term, the court must identify the inter-nodal links that tie an expression into the network of other expressions.¹⁸⁸ Unlike denotational meaning, ideational meaning accommodates the PHOSITA’s technological and temporal biases in the same manner—by tweaking links.¹⁸⁹

To return to the coffee sleeve hypotheticals, the meaning of “encircling” for everyone might be defined and fixed by its complex

¹⁸⁴ See *DIVERS*, *supra* note 164, at 8; *LEWIS*, *supra* note 106, at 7.

¹⁸⁵ See *LYONS*, *supra* note 153, at 233 (“[S]peakers are constrained by certain kinds of accessibility in their selection, or construction, of the possible worlds that they refer to . . .”). To say that the PHOSITAs sort identically is the same as saying that they give the claim language the same ideational meaning. See *infra* notes 192–93 and accompanying text (noting that at the time of filing there is no practical distinction between denotational and ideational meaning).

¹⁸⁶ *Smithkline Beecham Corp. v. Excel Pharm., Inc.*, 356 F.3d 1357, 1363 (Fed. Cir. 2004).

¹⁸⁷ See *supra* notes 72–75 and accompanying text (presenting the coffee sleeve hypotheticals).

¹⁸⁸ See *supra* Part IV.A.2 (explaining ideational meaning).

¹⁸⁹ Cf. *supra* text accompanying notes 35–37 (discussing the PHOSITA’s technological and temporal biases).

relationship of sometimes, but not always, being a kind of “hollow cylinder” or “ring.”¹⁹⁰ The limitation “insulating” might be defined and fixed in part by incompatibility links with the concepts of “conductive” or “transmitting” for everyone.¹⁹¹ The technological bias, however, suggests that “insulating” for the PHOSITA of coffee drinking technology still means something slightly different than “insulating” does for the PHOSITA of structural engineering. The latter’s network contains prominent links between the expression/concept “insulating” and other expressions/concepts like “building fire” and “boiler explosion,” whereas the former’s network links “insulating” to “pain” and “fingertips.”

To give the PHOSITA her temporal bias and to head off the possibility of change in meaning over time, a court freezes the network on the date the claim is filed. For example, the ideational definition of “insulating” to the PHOSITA of coffee drinking technology might become more restrictive after the date on which the claim is filed if scientific progress were to shockingly reveal that exposing our fingertips to even slight increases in temperature over extended periods of time has significant adverse medical consequences. The concept of “adverse medical consequences” would have a more prominent link in the network of linkages that define “insulating” after this revelation than it did before, and the generality of the semantic meaning of “insulating” to the PHOSITA would decrease over time. Such shifts in the temporally and technologically advanced PHOSITA’s inter-lexical network must be ignored in fixing the meaning of “insulating” on the date the claim was made.

3. *The Stakes: The Progressive Dimension of Literal Claim Scope*

If the same set of things infringed ideationally and denotationally construed claims, then an inquiry into the theory of meaning that courts use during claim construction might be of academic interest, but it would not be of economic interest to patent owners. However, the decision of a court to use one theory of meaning or the other has significant economic implications for patent owners over time. What is at stake in the choice between ideational and denotational meaning is, and is nothing more than, the reach of literal claim scope into possible things that were inaccessible to the PHOSITA at the time of filing.

At the time of filing, there is no practical import to the distinction between denotational and ideational meaning. At this time, the notion of inaccessible possible things is irrelevant. Inaccessible possible things cannot infringe because they do not exist in the actual world. The denotational and ideational variants of meaning-scope thus pick out an identical set of things at that time. This equivalence follows from the fact

¹⁹⁰ Cf. *supra* note 174 and accompanying text (giving an example of entailment).

¹⁹¹ Cf. *supra* note 175 and accompanying text (giving an example of incompatibility).

that the intension of a term is by definition a function for determining the term's extension.¹⁹² Only objects possessing the properties comprising the term's intension are included in the term's extension.¹⁹³ However, as time progresses and AAT is discovered after the date of filing, an important difference between ideational and denotational meaning develops.

By equating meaning with a set of accessible possible things, denotation fixes historical reference and extension as part and parcel of its fixation of historical meaning. Membership in the set of possible things within the extension of a term is closed when meaning is fixed on the date of filing. If a possible thing is inaccessible to the PHOSITA on the date a claim is filed, the fixation of meaning on that date leads to the exclusion of that possible thing from literal claim scope. Courts that employ a denotational theory of meaning must choose between fixation and growth: stability in meaning depends on stability in the set of propertized thing-types, and, inversely, expansion of the set of thing-types described necessarily expands meaning. In sum, AAT cannot literally infringe a claim with a denotationally fixed meaning-scope if the post-filing inclusion of the AAT within the claim would expand the claim's thing-scope.¹⁹⁴

¹⁹² See David Lewis, *General Semantics*, 22 *SYNTHESE* 18, 25 (1970).

¹⁹³ Thus, procedurally, a court fixing denotation may initially determine ideational meaning and proceed by subtraction of possible things that were inaccessible to the PHOSITA on the date of filing.

¹⁹⁴ There are two types of AAT that can infringe without expanding thing-scope and that therefore can fall within the scope of a denotationally construed and historically fixed claim. First, there is extrinsic-property AAT, in both its essential and policy-driven ersatz forms. The mere Cambridge growth in thing-scope that such AAT triggers upon its inclusion does not expand the claim's thing-scope, at least when measured by the legally relevant metric of thing-types. See generally *supra* Part III (discussing thing construction). Second, there is intrinsic-property AAT that *actualizes*, but does not *expand*, thing-scope. The basic notion here is that some after-arising technologies result from the post-filing discovery of a means of making a possible thing that was already conceptually accessible to the PHOSITA on the date of filing. When discovered, this AAT does not expand thing-scope because it was already within the claim's denotational meaning on the date of filing. It was a possible thing accessible to the PHOSITA on that date. What changed after the date of filing is only that technological progress produced the information necessary to make tokens of that accessible thing-type in the actual world, hence the title scope-actualizing AAT. The existence *vel non* of tokens of things in the actual world described by the claim language is irrelevant to thing-scope, see *supra* notes 28–29 and accompanying text, so this post-filing development does not affect thing-scope.

Although valid literal claims can reach into extrinsic-property AAT, they cannot reach into scope-actualizing AAT. This is true regardless of the theory of meaning that a court uses to construe the claim, because the obstacle is not infringement and does not result from claim construction doctrine. (Scope-actualizing AAT can be described even by claims construed with a denotational theory of meaning, so it can also be described by ideationally construed claims.) Rather, the insurmountable hurdles lies in the commensurability analysis of the enablement doctrine: if a claim describes more possible things on its date of filing than the PHOSITA knows how to make (i.e. knows how to turn into tokens of things in the actual world) at that time, the scope of the claim is not commensurate with the disclosure upon its filing. See *supra* notes 47–48 and accompanying text.

To illustrate the difference between scope-actualizing AAT and scope-expanding AAT, consider two scenarios that address, first, a simplified version of the facts presented in *Plant Genetics Systems v. DeKalb Genetics Corp.* and, second, a hypothetical variant of the case. *Plant Genetics Sys. v. DeKalb Genetics Corp.*, 315 F.3d 1335, 1337–38 (Fed. Cir. 2003). A molecular biologist claims a “plant cell containing gene X.” At the time of filing, there are—and have been for many years—two known types of plants: monocots and dicots. The disclosure accompanying the claim teaches the PHOSITA how to

In stark contrast, stabilizing the ideational meaning of a claim on the date of filing does not mandate stabilizing the set of thing-types propertized by the claim. The sense of a term is first and foremost a mental construct. It is not the set of things described by the claim, but the set of criteria that one uses to determine whether a thing falls within or outside the claim. After the sense of a word has been fixed, a fact finder can still query how a newly discovered thing would have been classified by the preexisting, fixed linguistic network of expressions. Because it is comprised only of word-to-word relationships, ideational meaning leaves open the possibility of anachronistic infringement hypotheticals that involve time-traveling objects. If the PHOSITA at the time of filing were to be presented with the allegedly infringing thing (that is technically inaccessible to her due to her ordinary level of foresight), would her fixed mental construct of meaning describe the AAT? Later-developed things can be examined to see whether they have the properties specified by the network of sense relations fixed on an earlier date. For example, after-arising coffee sleeves embodying post-claim technology in the form of geometries and materials inaccessible to the PHOSITA at the time of filing can be transported back in time as part of the infringement determination. In contrast, when a fixed meaning implies a fixed reference as it does in a denotationally construed claim, there can be no anachronistic infringement hypotheticals involving time-traveling things.

One way to clarify the economic implications of denotational and ideational theories of meaning in claim construction is to measure literal

make only a dicot cell containing gene X. It does not disclose either literally or constructively how to make a monocot cell containing gene X. The first scenario involves defendants who produce intrinsic-property AAT in the form of a monocot cell containing gene X. Critically, this AAT does not expand the thing-scope of the claim to a “plant cell containing gene X.” The PHOSITA at the time of filing already knows that the claim encompasses this specific type of AAT; the PHOSITA is able to refer to monocot cells containing gene X in conversation without being prescient in a way that destroys her ordinarieness. In the language of the actual *Plant Genetics Systems* opinion, monocot cells containing gene X are “not an unknown concept that [comes] into existence only after” the date of filing. *Id.* at 1340. They are AAT that is “specifically desired but difficult to obtain” at the time of filing. *Id.* A monocot cell containing gene X is, at the time of filing, already an object of thought in the PHOSITA’s mental world. Because the meaning of a literal claim to a “plant cell containing gene X” encompassed AAT that actualized but did not expand claim scope, the Federal Circuit in its actual holding in *Plant Genetic Systems* invalidated the claim for lack of enablement. *Id.* at 1339–44. In the second scenario (the hypothetical variant on *Plant Genetic Systems*), assume that the researchers produce a different intrinsic-property AAT, this time in the form of the apocryphal tricot genus of plants and, more specifically, a tricot patent cell that contains gene X. Unlike the monocot cell containing gene X, the tricot cell containing gene X is scope-expanding AAT—the transformed tricot cell becomes a possible thing accessible to the PHOSITA only after the date of filing. The PHOSITA lived for years with the belief that all plants were either monocots or dicots. At the time of filing, tricots are not on the PHOSITA’s radar screen as a possible technological innovation. The PHOSITA of ordinary foresight cannot reasonably be attributed with possession of the concept of a tricot plant, let alone a tricot cell containing gene X. Therefore, upon the invention of tricot plants and cells, the thing-scope of the claim to a “cell containing gene X” must expand if it is to encompass the AAT. Whether such scope-expanding AAT falls within the literal scope of a claim whose meaning has been fixed on the date of filing hinges on the meaning of meaning adopted by courts during claim construction.

thing-scope on two distinct dimensions: a *static dimension* and a *progressive dimension*. The static dimension of thing-scope measures the size of thing-scope on the date a claim is filed, and it thus only encompasses possible things accessible to the PHOSITA on that date. As its name implies, the static dimension of literal claim scope does not expand over time to incorporate later-discovered types of things. It is as broad on the claim's date of filing as it will ever be. Inversely, it is the progressive dimension that grows over time to incorporate all of the possible things that were inaccessible to the PHOSITA on the date of filing but that come to be encompassed by a claim over time. At the time of filing, the progressive dimension of literal claim scope is a null set, but it can grow deep by the time a patent expires. If a claim is construed denotationally, thing-scope is the static dimension of claim scope and nothing more. It cannot grow to encompass possible things inaccessible to the PHOSITA on the date of filing. However, a claim with a fixed ideational meaning-scope is the sum of the static and progressive dimensions. It is the progressive dimension of literal claim scope that is at stake when a court makes a choice between ideational and denotational meaning in claim construction.

Unlike a denotational theory, an ideational theory of meaning permits play, or a degree of freedom, between meaning and reference and, therefore, between meaning-scope and thing-scope. It resolves the fixation-growth paradox without contradiction: it allows thing-scope to grow throughout the term of the patent without requiring a post-filing shift in meaning-scope.¹⁹⁵ It leaves open the possibility that the fixed language of a claim can read on intrinsic-property AAT that expands thing-scope after the date of filing.¹⁹⁶

C. *What Courts Do*

What do courts mean when they say they fix meaning during claim construction? Do they fix denotational or ideational meaning? This subsection argues that ideational meaning is the default but that a more precise answer depends on whether the court is construing structural or functional language.¹⁹⁷ Courts always use ideational meaning to construe

¹⁹⁵ Cf. *supra* note 79 and accompanying text (arguing that the fixation-growth paradox is an equivocation that can be resolved by identifying ambiguities in the concept of claim scope).

¹⁹⁶ Joshua Sarnoff has characterized ideational meaning that fixes the claim's meaning-scope yet allows the claim's thing-scope to expand as a type of meaning in which there is a fixed meaning and an expanding application of that meaning. Joshua D. Sarnoff, *The Doctrine of Equivalents and Claiming the Future after Festo*, 14 FED. CIR. B.J. 403, 428–29 (2005).

¹⁹⁷ The functional/structural distinction is a staple of patent law: "the characterization 'functional' . . . indicate[s] . . . that an attempt is being made to define something . . . by what it does rather than by what it is (as evidenced by specific structure or material, for example)." *In re Swinehart*, 439 F.2d 210, 212 (C.C.P.A. 1971). However, it is not a true dichotomy. Structural words may be defined functionally. *See id.* at 215 (Lane, J., concurring) ("[A] 'door' is something used to close and open a

functional language, but they sometimes flip from ideational to denotational meaning when construing structural language.

1. *Functional Language and Ideational Meaning*

Unmitigated functional claim language in product claims has long been one of the bugaboos of patent law.¹⁹⁸ In the first half of the twentieth century, the Supreme Court regularly invalidated claims that used functional language to describe devices at the point of novelty.¹⁹⁹ The drumbeat resounding through these opinions is a concern about granting an inventor control over a nebulous array of post-invention technologies that were inaccessible to the PHOSITA on the date the claim was filed. In other words, it is a concern that functionally defined claims lead to excessive depth on the progressive dimension of literal claim scope. As the Court stated in *Halliburton Oil Well Cementing Co. v. Walker*:

Just how many different devices there are of various kinds and characters which would [fulfill the claimed function], we do not know In this age of technological development there may be many other devices beyond our present information or indeed our imagination which will perform that function and yet fit these claims.²⁰⁰

These concerns about excessive depth on the progressive dimension of thing-scope demonstrate that courts unquestioningly use an ideational theory of meaning to construe functional limitations in product claims. Only ideationally construed claims can expand over time to encompass AAT that expands thing-scope and that was inaccessible to the PHOSITA on the date of filing.²⁰¹ “[D]evices beyond our present information or indeed our imagination”²⁰² are *per se* inaccessible to the PHOSITA at the time meaning is stabilized, so denotational meaning would not raise the concerns that trouble courts with respect to functional language. In theory, courts could use a denotational theory of meaning to construe functional language in product claims, but they never do.²⁰³

passageway; a ‘nail’ is an object used to hold two pieces of material together; a ‘black’ material is one incapable of reflecting visible light.”)

¹⁹⁸ See generally Paul M. Janicke, *The Crisis in Patent Coverage: Defining Scope of an Invention by Function*, 8 HARV. J.L. & TECH. 155 (1994).

¹⁹⁹ E.g., *Halliburton Oil Well Cementing Co. v. Walker*, 329 U.S. 1, 9 (1946); *General Elec. v. Wabash Appliance*, 304 U.S. 364, 371 (1938); *Holland Furniture Co. v. Perkins Glue Co.*, 277 U.S. 245, 256–58 (1928).

²⁰⁰ *Halliburton*, 329 U.S. at 12.

²⁰¹ See *supra* Part IV.B.3 (discussing the stakes of choosing denotational and ideational meaning in claim construction).

²⁰² *Halliburton*, 329 U.S. at 12.

²⁰³ Stylistically, most product claims employing purely functional claim limitations are written in a means-plus-function format, i.e., as a “means” or “device” for performing a particular function. The Supreme Court in *Halliburton* could have defined the “means” or “device” in question denotationally

Courts also unwaveringly use ideational meaning to construe functional language in process claims. Process claims are restricted neither by the set of instrumentalities that the inventor discloses²⁰⁴ nor by the broader set of instrumentalities deemed accessible to the time-bound PHOSITA at the time the claim is made.²⁰⁵ As in product claims, the issue is not that functional language in process claims cannot be construed denotatively. Rather, possible-world formulations are merely less intuitive to courts when they construe functional claim language.²⁰⁶

2. Structural Language and Oscillation²⁰⁷

The Seventh Circuit's 1974 opinion in *Laser Alignment, Inc. v. Woodruff & Sons, Inc.* provides an instructive example of how courts follow through on an ideational approach to meaning while fixing meaning-scope.²⁰⁸ The patented invention involved a new method of laying pipe. Where the laying of pipe had previously used a string as a linear reference to ensure the overall alignment of the individual pipe sections, the patent taught the use of a focused beam of light.²⁰⁹ It claimed: "[a] method of laying . . . pipe sections . . . comprising the steps of [(a)] projecting a collimated narrow beam of light from said source position along the selected axis," and (b) using the beam of light to align the pipe sections.²¹⁰ The disputed structural term was "a collimated narrow beam of light," and the allegedly infringing technology used a laser to generate the

by looking only to the set of possible things capable of performing the function that were accessible to the PHOSITA on the date that the claim was made. With respect to claims written in means-plus-function format today, Section 112, Paragraph 6 specifies an alternative method of claim construction that approximates denotational meaning. Partially in response to *Halliburton*, Congress legislated that claimants may use functional language "without the recital of structure"—that is, with only recitation of a generic structural placeholder such as "means" or "device"—but that courts must limit claim scope to accused devices that possess the structure of the device disclosed in the patent specification or that structure's equivalent. 35 U.S.C. § 112 para. 6 (2006).

²⁰⁴ See *Waxman v. Smith*, 294 U.S. 20, 22–23 (1935) (explaining that the defendant did not avoid infringement by employing the patented process in a different machine); *Cochrane v. Deener*, 94 U.S. 780, 787–88 (1877) (noting that process patents are not restricted to one instrumentality or machine).

²⁰⁵ See DONALD S. CHISUM, CHISUM ON PATENTS, § 1.03[7] n.625 (2008) ("[A] process patent claim may cover . . . the unauthorized carrying out of the process on [a] different, even significantly improved apparatus.").

²⁰⁶ Philosophers of the possible-world persuasion advocate the use of sets to give substance to generic descriptions of events or actions by identifying events "with properties of the spatiotemporal regions in which they occur." DIVERS, *supra* note 164, at 10; see LEWIS, *supra* note 106, at 83–84 (noting the possibility of identifying an event with reference to the set of "spacetime regions where [the event] occurs"). Courts could quantify over possible spatiotemporal regions as they quantify over possible things. It is likely the same intuitive difficulty that prevents courts from construing functional language with a denotational theory of meaning that has also prevented any court from ever applying Section 112, Paragraph 6 to process claims, despite the express statutory authorization to interpret process claims as step-plus-function claims. 35 U.S.C. § 112 para. 6.

²⁰⁷ Many of the cases discussed in this subsection were addressed by Mark Lemley in *Changing Meaning*, *supra* note 4, under the rubric of fixed versus changing meaning.

²⁰⁸ *Laser Alignment, Inc. v. Woodruff & Sons, Inc.*, 491 F.2d 866 (7th Cir. 1974).

²⁰⁹ *Id.* at 869 & n.1.

²¹⁰ *Id.* at 869 n.1.

reference mark—a technology that was not invented until after the claim had been filed.²¹¹

The district court construed the term denotatively. It held that the extension of the term at the time the claim was filed was limited to possible things accessible to the PHOSITA at the time the claim was filed.²¹² Fixing meaning on a particular date meant closing membership to the set of objects that constituted the propertized resource.

The Seventh Circuit reversed and fixed the meaning of the disputed term by fixing its sense or intension: “The laser beam, like the white light beam . . . is a ‘collimated narrow beam of light’ called for by the . . . patent.”²¹³ The court probed the sense of “collimation,” examining the other words in relation to which collimation achieved meaning. “Collimation” acquired meaning through a relationship of synonymy with the concept of “directionality”; collimated beams of light were understood as incompatible with the concepts of light “emit[ted] . . . in all directions” and light beams characterized by the “element of divergence.”²¹⁴ The court then implicitly framed the question of infringement as an anachronistic hypothetical with a time-traveling object. If the PHOSITA at the time the claim was made were to be handed a laser by a time-traveling judicial agent, would she understand the beam of light produced by the laser to be a “collimated narrow beam of light”? Stabilizing meaning on the date on which a claim is made did not require finalizing the set of things to which the claim could refer.²¹⁵

The fact that the example chosen to illustrate a court’s express use of ideational meaning to construe structural language dates back over three decades could be taken to undermine the position taken here—that ideational meaning is the default for structural terms during claim construction. However, no such inference against ideational meaning as the default should be drawn. Ideational meaning is so firmly rooted as the default that, in most instances, the presence of AAT inaccessible to the PHOSITA at the time of filing is not even brought to the attention of courts by the litigants and thus no robust case law addressing the progressive dimension of literal claim scope has developed.²¹⁶ For example,

²¹¹ *Id.* at 869.

²¹² *Id.* at 871.

²¹³ *Id.* at 872.

²¹⁴ *Id.* at 869–70.

²¹⁵ *Id.* at 872. The court also justified its claim construction on the fact that the structural term was used in a process claim. *See id.* However, this aspect of the court’s reasoning goes against the grain of contemporary doctrine. Structural limitations are interpreted in the same manner whether they are in object or process claims.

²¹⁶ One district court opinion did recently justify at length its ideational definition of the limitation “an antiretroviral agent.” *Leland Stanford Jr. Univ. v. Roche Molecular Sys., Inc.*, 528 F. Supp. 2d 967, 979, 980 (N.D. Cal. 2007) (“[T]he temporal context espoused by *Phillips* is the *meaning* of the term to a person of ordinary skill at the time of the invention. The term in question may be a category, the contents of which expand over time . . .”).

Interactive Gift Express, Inc. v. Compuserve, Inc. involved a claim to an “information manufacturing machine” filed in 1982, and the plaintiff alleged that the claim read on a personal computer connected to the Internet in the late 1990s.²¹⁷ Clearly, many of the things comprising the allegedly infringing technology were after-arising things inaccessible to the PHOSITA of 1982. Nonetheless, the issue of AAT was never even raised in the Federal Circuit opinion. To the same ends, consider the coffee sleeve hypothetical involving an after-arising geometry.²¹⁸ If this case were litigated, a court would unquestioningly hold that the AAT literally infringes. It would be unlikely even to raise a red flag about expansion of thing-scope. This judicial acquiescence strongly suggests that an ideational theory of meaning is at work.²¹⁹

The presumption that thing-scope can expand along a progressive dimension extends to patent commentary as well. For example, as Michael Meurer and Craig Nard presume in the context of their analysis of the doctrine of equivalents:

An inventor, familiar with [a] trend [toward lighter and stronger rackets], should describe the material used to make his racket in general terms, and then the patent claim will literally cover a racket of the same shape and dimension even if it is made from a substance that was not known at the time of the patent application.²²⁰

Although an ideational theory of meaning is arguably the default, courts flip over and apply a denotational theory of meaning in some claim constructions. The Federal Circuit’s opinion in *Schering Corp. v. Amgen, Inc.* exemplifies denotational reasoning.²²¹ Schering claimed recombinant DNA molecules coding for “a polypeptide of the IFN- α type.”²²² At the time the claim was filed, there was only one known polypeptide that was an “IFN- α ,” i.e., “IFN- α ” referred to only one thing-type.²²³ After the claim was filed, new variants of IFN- α were discovered, and the scientific community “acknowledged the possibility of different IFN- α subtypes.”²²⁴ The Federal Circuit construed the term “IFN- α ” denotationally and left the later-discovered IFN- α subtypes outside of the patent’s literal scope. “Because, at the time of . . . application, neither [the inventor] nor others skilled in the art knew of the existence of, let alone the identity of, the

²¹⁷ *Interactive Gift Express, Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1327–29 (Fed. Cir. 2001).

²¹⁸ See *supra* text accompanying notes 72–75 (presenting the after-arising geometry hypothetical).

²¹⁹ An alternative explanation for the new-geometry coffee sleeve hypothetical is that a court would treat it as ersatz extrinsic-property AAT. See *supra* text accompanying notes 141–46.

²²⁰ Meurer & Nard, *supra* note 75, at 1976–77.

²²¹ *Schering Corp. v. Amgen, Inc.*, 222 F.3d 1347 (Fed. Cir. 2000).

²²² *Id.* at 1350.

²²³ *Id.* at 1352.

²²⁴ *Id.* at 1353.

specific polypeptides now identified as subtypes of IFN- α , those subtypes cannot be within the scope of the claims.”²²⁵ Stable meaning was established through stable reference, and post-claim growth in the set of thing-types to which “IFN- α ” referred would have triggered impermissible evolution in the meaning of “IFN- α .”²²⁶

Similarly, whenever a court broadly proclaims in relation to a structural claim term that “later developed technologies may not fall within the literal scope of the patent,”²²⁷ it presumes a denotational theory of meaning. Whenever a court holds that there is no infringement because “no one of [sic] ordinary skill in the art would have or could have described such [things] at [the] time” of filing,²²⁸ or states categorically that claims should not “be construed broadly enough to encompass technology that is not developed until later,”²²⁹ it presumes a denotational theory of meaning. Such statements are inconsistent with the default of pinning meaning-scope to the fixed sense of the claim language.²³⁰

V. THINGS AND MEANINGS AS POLICY LEVERS

Courts’ ability to construct things and define meaning demonstrates that the fixation and growth theories are not the only options for a logically coherent patent doctrine dealing with the relationship between literal claim scope and AAT. The set of infringing technologies proptertized by a stable, notice-enhancing peripheral patent claim need not be reified into a set that is fully enumerable *ex ante* or that categorically excludes AAT.

The tendency to reify inherent in the fixation and growth theories is, in part, fostered by the prevalence of real-property analogies in patent discourse. Peripheral claims are presumed to “describe the outer limits or

²²⁵ *Id.* at 1353–54.

²²⁶ *Cf. id.* at 1353 (“The scientific meaning of ‘IFN- α ’ evolved with new discoveries.”).

²²⁷ *IPPV Enters. v. Echostar Commc’ns Corp.*, 106 F. Supp. 2d 595, 606 (D. Del. 2000); *see also id.* at 604–06 (construing the phrase “television program signal” to mean “analog television signal”).

²²⁸ *Symbol Techs., Inc. v. Lemelson Med., Educ. & Research Found.*, 301 F. Supp. 2d 1147, 1164 (D. Nev. 2004) (construing the term “scanning apparatus” to not read on devices capable of “scanning by means of a laser or CCD camera”).

²²⁹ *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247, 1262 (Fed. Cir. 2004) (Bryson, J., concurring).

²³⁰ One coherent category of claims in which courts flip to denotational meaning merits separate attention. Some claims recite a *temporal index* like “currently” that specifically references what is happening at the time the claim is filed. *Cf. LYONS, supra* note 153, at 227 (defining one type of temporal index as “a means of identifying the world that is actual at the time of speaking”). Courts frequently apply denotational meaning—or at least expressly consider doing so—when construing temporal indices. *See, e.g., PC Connector Solutions LLC v. Smartdisk Corp.*, 406 F.3d 1359, 1362–64 (Fed. Cir. 2005) (holding that the terms “normally connectible,” “a conventional computer,” “traditionally connectible,” and “standard input/output port” are to be understood by their ordinary and customary temporal meanings); *Superguide Corp. v. DirecTV Enters.*, 358 F.3d 870, 896–97 (Fed. Cir. 2004) (Michel, J., concurring) (holding that a person of ordinary skill in the art would define “regularly received television signal” to include both analog and digital forms); *Kopykake Enters. v. Lucks Co.*, 264 F.3d 1377, 1382 (Fed. Cir. 2001) (holding that “screen printing” includes “any . . . conventional printing process”).

boundaries of the invention in the same fashion as the description of land in a deed defines the outer limits of the land monopoly.²³¹ The metaphor has explanatory value, especially when a peripheral claiming regime is juxtaposed to a central claiming regime.²³² However, it is also misleading. The metes and bounds of a parcel of land specify the location of a spatial boundary and therefore identify a bounded set of propertized tokens of things.²³³ In contrast, peripheral patent claims identify types of things rather than tokens of things, and the granularity inherent in a thing-type means that thing-types can be fixed while the set of discernable thing-tokens that literally infringes grows.²³⁴ Furthermore, if claim construction uses ideational meaning, there is play between meaning-scope and thing-scope, and peripheral claims fix the only criteria required for inclusion of a thing-type in the propertized set, not the set of thing-types included.²³⁵

Once the real-property bias is dispelled, the false choice between the fixation and growth theories can be left behind. Moving forward with the economic import of things and meanings openly on the table, there are two fundamentally different ways of understanding how courts should construct things and define meaning. The first presumes that things and meanings should be entities exogenous to patent policy. This approach searches for stable metaphysical or conventional groundings for things and meanings. Courts' uniform, unerring treatment of extrinsic-property AAT is likely an example of this approach in thing construction.²³⁶ Similarly, perhaps courts can defer to the understanding of an objective, factually determined PHOSITA to sort ideationally and denotationally construed claim terms. Maybe there are some limitations that the average practitioner of a technology on a certain date understands to refer to a fixed group of possible things (i.e., to denote a fixed extension) and there are other terms that she understands to encompass an open-ended category of things that meet certain fixed criteria (i.e., to establish a fixed intension).²³⁷

The second approach to constructing things and defining meaning

²³¹ FABER, *supra* note 67, § 10:8.1; *see also* Motion Picture Patents Co. v. Universal Film Mfg. Co., 243 U.S. 502, 510 (1917) (using a "metes and bounds" analogy).

²³² *Cf. supra* text accompanying notes 20–22 (comparing peripheral and central claiming).

²³³ Actually, the tokens of things within the spatial boundary of a parcel of land can change over time. Erosion and deposit of soil, for example, constantly shift the particles of dirt owned by a land owner. Property in land technically fixes only a spatial container, but the spatial container is an acceptable proxy for the set of thing-tokens within it.

²³⁴ *See generally supra* Part III (discussing thing construction).

²³⁵ *See generally supra* Part IV (discussing the choice between ideational and denotational meaning in claim construction).

²³⁶ *See supra* text accompanying notes 128–33 (observing that courts never treat extrinsic properties as relevant to the identities of thing-types during thing construction).

²³⁷ *Cf. Leland Stanford Jr. Univ. v. Roche Molecular Sys., Inc.*, 528 F. Supp. 2d 967, 980 (N.D. Cal. 2007) ("It is clear . . . that a person of ordinary skill in the art would have known that the category of 'antiretroviral agents' would only expand over time to include these new agents."); Feldman, *supra* note 12, at 20–21 (suggesting in effect that the Federal Circuit in *Schering* used a denotational theory of meaning because the time-bound PHOSITA understood the term denotationally).

acknowledges that both are concepts shaped in some way by patent policy relating to the optimal strength and nature of patent incentives. According to this view, things and meanings are “doctrinal policy levers.”²³⁸ Appropriating the terminology coined by Michael Madison, perhaps patent courts should construct “things by policy” rather than either “things by nature” (if the exogenous distinction is grounded in metaphysics) or “things by practice” (if the exogenous distinction is grounded in convention or widely shared intuitive understandings).²³⁹ Extending the terminology, perhaps courts should also generate meaning by policy. If things and meanings are policy levers, the categories of AAT that are designated as literally infringing *vel non* can be identified, in part, based on the strength of the patentee’s normative argument for control over the category in question.

The advantage of thing and meaning by policy approaches is that literal claim scope can be tailored more closely to the social optimum.²⁴⁰

²³⁸ See Burk & Lemley, *Policy Levers*, *supra* note 16, at 1640 (noting a court’s discretion to use doctrinal policy levers).

²³⁹ Madison, *supra* note 80, at 386. Madison suggests that patent law illustrates a things by nature approach to thing construction. *Id.* at 411–12. Although the rhetoric of patent opinions is unquestionably influenced by a thing by nature approach, what courts do arguably demonstrates that a thing by policy approach often prevails. See *supra* text accompanying notes 141–46 (discussing the generation of ersatz extrinsic-property AAT during thing construction).

²⁴⁰ *But cf. infra* text accompanying notes 250–51 (noting the pervasive uncertainty about the socially optimal claim scope). A counterargument suggests that the reach of literal claim scope into AAT should not be tailored at all because patent law should embrace the fixation theory, categorically exclude AAT from literal claim scope, and adopt a specialization of doctrinal labor under which rights to exclude from AAT are available only under the doctrine of equivalents (DOE). See Lemley, *supra* note 4, at 120–21 (arguing only the DOE should grant patentees rights to exclude from AAT); Cotropia, *supra* note 3, at 152, 168–201 (presuming that literal claim scope cannot reach into AAT in the course of proposing the optimal extent of the DOE’s reach into AAT). Tailoring the reach of a patentee’s rights into AAT with the DOE does have at least one advantage—the timing of the inquiry at the time of infringement, *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 37 (1997), reveals information about the private and social values of the patented invention that aids in the judicial fine-tuning of claim scope. See Doug Lichtman, *Substitutes for the Doctrine of Equivalents*, 93 GEO. L.J. 2013, 2021, 2028 n.63 (2005) (“Description can be well accomplished at the time an application is first filed; scope, however, is often better determined later in time when more information is available.”). However, the availability of the DOE does not provide a good reason to forgo the tailoring of literal claim scope altogether. The DOE undermines the public notice provided by peripheral patent claims. See *Warner-Jenkinson*, 520 U.S. at 29–30 (expressing concern that the DOE may “vitiate” the public-notice function of peripheral patent claims). *But see* Burk & Lemley, *supra* note 152, at 52–55 (arguing that the scope of a peripheral claim is so uncertain that increased reliance on the DOE would not significantly reduce public notice). If the amount of AAT that falls under a patentee’s control in the contemporary patent regime is anything close to the optimal benchmark, then taking the fixation theory seriously and relying on the DOE for all protection of AAT would considerably expand the role of the DOE and lead to considerably more uncertainty. *Cf. supra* text accompanying notes 66–78 (noting the pervasive nature of a patentee’s control over AAT in contemporary patent law). Furthermore, a regime of literal claim scope that required the exclusion of all AAT might actually undermine certainty as the determination of what is and is not AAT is a difficult question that need not be asked in many cases if literal claim scope can encompass AAT.

Rather, inversely, it is the ability of literal claim scope to reach into AAT that should undermine the presumption that AAT is the “quintessential example” of a DOE equivalent. *Smithkline Beecham Corp. v. Excel Pharm., Inc.*, 356 F.3d 1357, 1364 (Fed. Cir. 2004). This presumption follows from a

Courts can set up rules to massage the strength of patent protection when they construct things and define meaning. Perhaps ideational meaning produces claims that are closer to optimal in some technological fields because inventors need temporally deeper claims, but denotational meaning works better in other fields because temporally shallow claims are, on average, more appropriate. Similarly, perhaps there are some categories of after-arising properties of a claimed technology that usually should be controlled by a patent owner, but there are other categories of after-arising properties that usually should not be controlled by a patent owner. In contrast, if courts' decisions about how to construct things and define meaning are exogenous to patent policy, then courts are more likely to dole out identical treatment for pairings of patentees and alleged infringers who are distinct from a normative perspective.²⁴¹

There are three plausible arguments to support exogenous groundings for things and meaning. They are, however, ultimately unconvincing to the extent they suggest that things and meanings should have exclusively exogenous groundings.²⁴²

First, exogenous constructions and definitions may take political pressure off of courts because they lend patent infringement determinations an air of inevitability,²⁴³ but this is primarily a private benefit for courts rather than a public benefit for society.

Second, exogenous groundings may sometimes provide strong public notice of literal claim scope. This is an important argument. If sufficiently

belief that a patent drafter suffers an unfair handicap in trying to describe AAT at the time of filing. *Sage Prods., Inc. v. Devon Indus., Inc.*, 126 F.3d 1420, 1425 (Fed. Cir. 1997). The belief, however, is based on the unnecessary reification of literal claim scope. *See supra* text accompanying notes 231–33 (noting that a peripheral claim need not be a set of things identifiable in full ex ante). Coarsely constructed things and ideational meaning allow claim drafters to describe at the time of application much of the technology that will exist by the time the patent expires. Furthermore, many of the restrictions that prohibit claim drafters from describing AAT literally are the result of deliberate policy choices intended to curtail the patentee's rights, not limits inherent in the nature of descriptive language. In a regime in which courts use the construction of things and the definition of meaning as policy levers, the patent drafter is unfairly or inefficiently disadvantaged at the time of filing not by *after-arising technology* itself but by the far rarer phenomenon of *after-arising language* without which the AAT cannot be described.

²⁴¹ In other words, the descriptive generalizations of patent claims will likely be more rule-like with exogenous groundings because they will be more under- and over-inclusive vis-à-vis the justifiable outcome. *See generally* FREDERICK SCHAUER, *PLAYING BY THE RULES: A PHILOSOPHICAL EXAMINATION OF RULE-BASED DECISION-MAKING IN LAW AND IN LIFE* 47–52 (1991) (portraying rules as entrenched generalizations that impose costs in the form of over- and under-inclusiveness in relation to the rule's justification).

²⁴² A mixed regime is certainly possible; there may be instances in which exogenous groundings happen to be extremely clear and correspond relatively well to the desired claim scope.

²⁴³ Exogenous groundings may be appealing to the Federal Circuit because the court often describes its role in the administration of patent law as mechanistic or ministerial. *See, e.g., In re Fisher*, 421 F.3d 1365, 1378 (Fed. Cir. 2004) (discussing, in the context of the utility doctrine, "public policy considerations which are more appropriately directed to Congress as the legislative branch of government, rather than this court as a judicial body responsible simply for interpreting and applying statutory law").

great, the benefits of increased certainty may outweigh the cost of the greater over- and under-inclusiveness that inheres in exogenous groundings.²⁴⁴ However, it is far from clear that exogenous groundings are categorically more certain than policy-inflected groundings. Exogenous groundings promote certainty only when there is a strong consensus about the correct metaphysical or conventional position. Is there really a single thing-type to which each and every allegedly infringing instance of AAT most naturally belongs? Can the meaning of meaning always be objectively grounded in the beliefs of the PHOSITA? Inversely, a thing or meaning by policy approach need not turn into a highly discretionary standard and unleash courts to make decisions on a case-by-case basis. So long as the policy-inflected things and meanings apply to an identifiable category of patents, technologies, or after-arising properties, public notice is not harmed by an express thing or meaning by policy approach.²⁴⁵ For example, consider the coffee sleeve hypothetical involving an after-arising plastic.²⁴⁶ When mechanical inventions are at issue, courts arguably frame things coarsely, treating growth in the number of literally infringing technologies that possess the property *being made from an after-arising material* as a kind of growth that never generates new thing-types or triggers a shift in thing-scope.²⁴⁷ To achieve this end, courts depart from the essentialist grounding of what a thing is intrinsically because materiality is an intrinsic property. Things made of different materials are not duplicates, and more than mere Cambridge contingency differentiates things made of different materials.²⁴⁸ Yet, the thing by policy approach does not undermine certainty.²⁴⁹ The rule that literal scope of claims to mechanical inventions extends into things made from after-arising materials is clear and administrable.

The third argument in favor of exogenous groundings is that tailoring the reach of literal claim scope into AAT so as to further patent policy is tantamount to chasing the white rabbit down the rabbit hole: things and meanings can become really disorienting really quickly under a policy-inflected approach because there is no consensus on patent policy. In its strongest form, the argument is simply that policy-inflected groundings are

²⁴⁴ SCHAUER, *supra* note 241, at 139–42.

²⁴⁵ More specifically, public notice is not harmed for the members of the public who have learned the relevant patent doctrine.

²⁴⁶ See *supra* text accompanying note 72–75 (discussing the coffee sleeve hypotheticals).

²⁴⁷ See *supra* note 75 (noting that embodiments of a mechanical invention made out of after-arising materials can fall within the literal scope of a claim without rendering the claim invalid for lack of commensurability with the disclosure).

²⁴⁸ See *supra* text accompanying notes 104–09 (discussing the distinctions between duplicates and indiscernibles, and real change and mere Cambridge change).

²⁴⁹ The rule is readily justified on policy grounds: the *ex ante* incentive to invent (or the *ex post* incentives to commercialize and innovate) would be too paltry if competitors could design around a mechanical patent every time an after-arising material is developed.

just as likely to decrease the optimality of patent protection as they are to increase it given the margin of error in the contemporary estimate of the nature and strength of the incentives that the patent regime should be providing to promote efficiency. This argument raises an important point that should not lightly be glossed over. The exposition in this Article of how courts construct things and define meaning is not intended to be a silver bullet for perfecting the reach of literal claim scope into AAT. Neither the construction of things nor the definition of meaning provides the form or model of the justifiable patent scope to which the protection should be tailored. What conduct should patent protection incentivize: the generation of inventive information, the commercialization of products, the coordination of technological progress, or something else?²⁵⁰ How strong should the incentives provided by patent protection be on average? How should protection be adjusted for different types of technology? These are difficult questions that one cannot answer solely through a technical analysis of thing construction and the meaning of meaning. These concepts are tools one can use to achieve ends, not ends in themselves. Nonetheless, it should not be the difficulty of the task that deters the creation of a more economically justifiable patent regime.²⁵¹

VI. CONCLUSION

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 AAT. The paradoxical nature of this situation—that literal claim scope is simultaneously fixed and expanding—does not present a logical impossibility. Courts can resolve the paradox without contradiction by constructing things and defining meaning. The construction of coarse things during thing construction masks the after-arising nature of AAT; it permits courts to label the growth in thing-scope that occurs when a literal claim encompasses AAT as legally insignificant, mere Cambridge growth. The use of ideational rather than denotational meaning in claim construction allows thing-scope to expand on a progressive dimension over time while meaning-scope remains stably fixed on the date of filing.

Once the import of thing construction and the meaning of meaning in

²⁵⁰ See, e.g., John F. Duffy, *Rethinking the Prospect Theory of Patents*, 71 U. CHI. L. REV. 439, 440–41 (2004) (arguing that patent doctrine should incentivize races to claim prospects to increase consumer surplus that results from invention); F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697, 703–04 (2001) (arguing that patents should incentivize the commercialization of technology); Fritz Machlup, *An Economic Review of the Patent System: Study of the Subcommittee on Patents, Trademarks, and Copyrights of the Senate Committee on the Judiciary*, 85th Cong., 2d Sess. 1, 15, 36, 77–78 (1958) (laying out an incentive to invent theory to justify patents).

²⁵¹ Cf. Mark A. Lemley, *Property, Intellectual Property and Free Riding*, 83 TEX. L. REV. 1031, 1066–67 (2005) (arguing that utilitarian analysis of intellectual property rights should persist despite the difficulty of identifying their optimal configuration).

contemporary patent practice is openly acknowledged, courts should not feel compelled to seek out the politically safe position in which things and meanings are depicted as entirely exogenous to patent policy. Things and meanings are policy levers that courts already do use—and should continue to use—to tailor the reach of literal claim scope into AAT in order to further the normative goals of patent protection.

