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Correcting Misunderstandings of Literal Infringement Scope Regarding After-Arising Technologies Protected by the Doctrine of Equivalents

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**CORRECTING MISUNDERSTANDINGS OF LITERAL
INFRINGEMENT SCOPE REGARDING AFTER-ARISING
TECHNOLOGIES PROTECTED BY THE DOCTRINE OF
EQUIVALENTS**

*Joshua D. Sarnoff**

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ABSTRACT

Based on conflicting Federal Circuit case law, many academics have written, and many practitioners likely believe, that claim meanings or their applications may expand over time for purposes of literal infringement. But this common wisdom is wrong. Under existing Federal Circuit rules, the first precedent controls in the event of a conflict over doctrine, unless and until reversed en banc. The first precedent on the

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issue, the 2000 Schering Corp. v. Amgen, Inc. case, held that claim scope does not reach after-arising technologies for literal infringement and suggested that if it did, then such claims would lack written description support. Under existing validity precedents, temporally expanding claim scope would violate both § 112(a)'s enablement and written description requirements, as explicitly held in the 1977 In re Hogan decision and as implied by the more recent 2010 Ariad Pharmaceuticals v. Eli Lilly & Co. en banc decision. Further, were claims able to expand over time for literal infringement, they would violate the axiomatic equivalency of claim scope for validity and infringement. Once it is recognized that claim scope for literal infringement does not protect against after-arising technologies, further resort will be made to seek such protection under the doctrine of equivalents. This not only highlights the importance of the Ariad Pharmaceuticals decision but also will cause a big change to current practices and will lead to increased uncertainty regarding the scope of patent protection.

This Article explains why academics and practitioners may be confused regarding the U.S. law of literal infringement's temporal scope. It describes the conflicting cases that have led to that confusion. And it explains why § 112(f)'s rule of construction for functional claiming language may be understood to limit all claim scope to temporally fixed, known-to-be equivalent technologies. This Article concludes by noting potential conflict with the pioneering invention doctrine and concerns should the law be changed to permit claiming the future.

I. INTRODUCTION

The modern “doctrine of equivalents” protects patent holders from infringement by after-arising technologies (also referred to as later-arising technologies) deemed factually equivalent to technologies known to be claim embodiments as of the effective filing date of claims. As the Supreme Court held in *Festo Corp. v. Shoketsu Kinzoku Kogyo, Kabushiki Co., Ltd.*,¹ where “[t]he equivalent [to embodiments of the construed claim language] may have been unforeseeable at the time of the application,” a presumptive prosecution history estoppel created by adopting a narrowing claim amendment will not bar a finding of infringement *under the doctrine of equivalents*.²

But that leaves an important question unaddressed. That question is whether, for purposes of so-called “literal” infringement, interpreted

1. *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 740 (2002).

2. *Id.* at 741 (emphasis added).

claim meaning and the application of such meaning: (1) may expand over time to encompass such after-arising, equivalent technologies; or (2) must remain fixed in time and excludes such technologies from being considered claim embodiments.³ If claim meaning or the scope of application of such meaning can expand over time for literal infringement purposes, then there is less need to resort to the doctrine of equivalents to protect against after-arising technologies. However, if claim meaning or application scope is limited to technologies that were known as of the filing date to be claim embodiments, then the doctrine of equivalents is necessary for any such protection.

As stated in 2000 by former Chief Judge Rader of the U.S. Court of Appeals for the Federal Circuit (“Federal Circuit”) in his *en banc* concurrence in the *Festo* case prior to the Supreme Court’s decision:

A primary justification for the doctrine of equivalents is to accommodate such unforeseeable, after-arising technology. Without a doctrine of equivalents, any claim drafted in current technological terms could be easily circumvented after the advent of an advance in technology. . . . Fortunately, the doctrine of equivalents accommodates that unforeseeable dilemma for claim drafters.⁴

Judge Rader’s discussion implicitly suggests that literal claim meaning and application scope *is* limited to equivalent *known-to-be embodiments* at the time of application filing. It also implicitly suggests that the doctrine of equivalents protects against after-arising technologies that *could not* validly be claimed under the written description doctrine. After-arising technologies are unforeseeable and therefore are not subjectively “possessed” by the applicant (nor objectively disclosed for skilled artisans to “visualize or recognize”) as of the filing date.⁵

Nevertheless, I believe that Judge Rader’s view is not the common wisdom. Rather, many academic writers state, and practitioners likely assume, that under current U.S. patent law, claim meaning or claim application scope *may* permissibly expand over time for literal infringement purposes. In doing so, claims may encompass after-arising technologies that were unforeseeable at the time of filing an application, i.e., not constructively recognized as claim embodiments by skilled

3. See generally Kevin E. Collins, *The Reach of Literal Claim Scope into After-Arising Technology: On Thing Construction and the Meaning of Meaning*, 41 CONN. L. REV. 493 (2008).

4. *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 234 F.3d 558, 619 (Fed. Cir. 2000) (*en banc*) (Rader, J., concurring), *vacated*, 535 U.S. 722 (2002).

5. *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1350–51 (Fed. Cir. 2010) (*en banc*). *Cf. id.* at 1352 (“[A] description that merely renders the invention obvious does not satisfy the requirement.”).

practitioners. I believe that this common wisdom is wrong, even if there are good reasons (from conflicting case holdings) why the common wisdom is thought to be the current law.⁶

The reason that I believe that the common wisdom is wrong is the failure to recognize and apply the Federal Circuit's rule regarding controlling precedent. That rule requires that an earlier-in-time panel precedent controls in the event of a conflict over doctrine, unless and until the Federal Circuit goes en banc to reverse that earlier precedent.⁷ Given the absence of clear Supreme Court precedent or en banc precedent on the issue of literal infringement by after-arising technologies, the *earliest* panel precedent controls. And the earliest precedent on the issue, *Schering Corp. v. Amgen, Inc.*,⁸ limits the temporal meaning and scope of application for literal infringement purposes to equivalent technologies known to be embodiments of the claim language as of effective filing date of the claim.⁹

Further, a holding that claim meaning may permissibly expand over time for literal infringement purposes so as to capture such after-arising technologies would violate the "axiomatic" equivalency of claim scope for purposes of validity and infringement.¹⁰ Claim meaning and

6. In fact, I made the same mistaken assumption in prior work, relying on conflicting decisions to suggest that claim *meaning* should be understood to be fixed as of the filing date, but that claim *application scope* may expand over time. See Joshua D. Sarnoff, *The Doctrine of Equivalents and Claiming the Future after Festo*, 14 FED. CIR. B.J. 403, 428–32 (2004) (citing and discussing *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247, 1257 (Fed. Cir. 2004), *SuperGuide Corp. v. DirectTV Enters., Inc.*, 358 F.3d 870, 896 (Fed. Cir. 2004), and *Plant Genetic Sys., N.V. v. DeKalb Genetics Corp.*, 315 F.3d 1335, 1340 (Fed. Cir. 2003)). Cf. *id.* at 432 n.147, 434 n.162 (discussing *Schering Corp. v. Amgen, Inc.*, 222 F.3d 1347 (Fed. Cir. 2000), without recognizing that it controls the issue).

7. See, e.g., *Robert Bosch, LLC v. Pylon Mfg. Corp.*, 719 F.3d 1305, 1316 (Fed. Cir. 2013) (en banc). Cf. *Tex. Instruments, Inc. v. U.S. Int'l Trade Comm'n*, 846 F.2d 1369, 1372–73 (Fed. Cir. 1988) (Nies, J., dissenting) ("A panel decision cannot overturn *any* precedential ruling of the court, even of a prior panel, much less that of an in banc court. See, e.g., *Capital Elec., Inc. v. United States*, 729 F.2d 743, 746 (Fed. Cir. 1984) (only court sitting in banc can overrule an earlier panel decision).").

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

9. See *id.* at 1351–53.

10. *Amgen, Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1330 (Fed. Cir. 2003) (citing *W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 842 F.2d 1275, 1279 (Fed. Cir. 1988)). See, e.g., *SmithKline Diagnostics, Inc. v. Helena Labs. Corp.*, 859 F.2d 878, 889 (Fed. Cir. 1988) (citing *W.L. Gore & Assocs.*, 842 F.2d at 1279, *Kimberly-Clark Corp. v. Johnson & Johnson*, 745 F.2d 1437, 1449 (Fed. Cir. 1984), and *Autogiro Co. of Am. v. United States*, 384 F.2d 391, 399 (Ct. Cl. 1967)). See also *Amazon.com, Inc. v. Barnesandnoble.com, Inc.*, 239 F.3d 1343, 1351 (Fed. Cir. 2001) ("Because the claims of a patent measure the invention at issue, the claims must be interpreted and given the same meaning for purposes of both validity and infringement analyses."). Cf. *Abbott Labs. v. Sandoz, Inc.*, 566 F.3d 1282, 1317–18 (Fed. Cir. 2009) (Newman, J., dissenting) ("It has been an inviolate rule that patent claims are construed the same way for validity and for infringement.") (citing cases).

application scope have long been limited to known embodiments of claim meaning as of the filing date for validity purposes under enablement cases. Patent specifications could not enable such temporally expanding claim meanings or application scope, as held *In re Hogan*,¹¹ a seminal 1977 precedent of the Court of Customs and Patent Appeals (whose precedents were adopted along with Court of Claims precedents as binding Federal Circuit precedents).¹² The same premises also apply under the written description doctrine cases. The specifications for such claims could not demonstrate that the applicant “possessed” the full scope of the claims as of the filing date, under the 2010 en banc holding in *Ariad Pharmaceuticals v. Eli Lilly & Co.*¹³

Thus, if claim meaning or application scope was construed to encompass after-arising technologies, the claim would necessarily be invalid. The *Schering* precedent assures that literal infringement claim meaning and application scope are co-extensive with validity claim meaning and application scope and, consequently, that claims are not invalidated on this basis. Conversely, any claims construed for literal infringement that would extend to after-arising technology should be held invalid, and thus would be incapable of being literally infringed. This highlights the importance of the *Ariad Pharmaceuticals* decision, as it not only limits claim scope but also precludes claims from being infringed by after-arising technologies.

Recognizing that literal infringement scope does *not* protect against *any* after-arising equivalent technologies, however, will result in substantial changes to existing patent practices. Insubstantial but subsequent changes to existing technologies, such as in software, will then be recognized as incapable of literally infringing. In particular, the recognition will generate even greater pressure to resort to the doctrine of equivalents to achieve such protection, and will generate greater procedural complexity and uncertainty regarding the scope of patent protection. This will pose even more starkly the concerns with relying on the doctrine of equivalents that were expressed by Lord Hoffmann in 2004, well before the recent change in United Kingdom (U.K.) law to

11. See *In re Hogan*, 559 F.2d 595, 604 (C.C.P.A. 1977) (limiting claim meaning for enablement doctrine to the meaning and claim embodiments recognized at the time of filing to avoid having later, unforeseeable technological developments invalidate claims); *S. Corp. v. United States*, 690 F.2d 1368, 1370 (Fed. Cir. 1982).

12. *S. Corp.*, 690 F.2d at 1370 (adopting as precedents holdings of the Court of Claims and of the Court of Customs and Patent Appeals prior to October 1, 1982).

13. See *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (affirming the written description adequacy test of an objective disclosure of subjective mental “possession” of the full scope of claimed subject matter).

adopt a doctrine of equivalents¹⁴ and to restrict reliance on so-called “purposive interpretation”¹⁵ for literal infringement determinations. As Lord Hoffmann noted earlier when rejecting the doctrine of equivalents, “once the monopoly ha[s] been allowed to escape from the terms of the claims, it is not easy to know where its limits should be drawn.”¹⁶ And as Lord Hoffmann further noted by comparison, “American patent litigants [will] pay dearly for results which are no more just or predictable than could be achieved by simply reading the claims.”¹⁷

The understanding that literal infringement scope does not reach after-arising technologies also does not conflict with the doctrine of equivalents holding of the Supreme Court in *Warner-Jenkinson Co. v. Hilton Davis Chemical Co.*¹⁸ In regard to what is now § 112(f),¹⁹ *Warner-Jenkinson* held that when Congress adopted a special interpretive rule for claim terms employing functional language, Congress did not thereby foreclose a doctrine of equivalents that provides protection beyond the scope of application of construed claim meaning.²⁰ But prohibiting literal

14. See *Eli Lilly & Co. v. Actavis UK Ltd.* [2017] UKSC 48, [54].

15. See *Catnic Components Ltd. v. Hill & Smith Ltd.* [1982] RPC 183, 184; *Improver Corp. v. Remington Consumer Prods. Ltd.* [1990] F.S.R. 181; *Kirin-Amgen, Inc. v. Hoechst Marion Roussel Ltd.* [2004] UKHL 46. Cf. Katherine Stephens, *Actavis v Lilly – A Year After the Revolution*, in ICLG THE INTERNATIONAL LEGAL GUIDE TO PATENTS 2019 4 (9th ed. 2019) (“In *Generics v. Yeda*, in the first decision to be handed down after *Actavis*, Arnold J was emphatically of the opinion that the law remained that a patent claim should be given a purposive and not a literal construction.”). See generally Paul England, *The scope of protection of patent claims in Europe and the UPC*, 11 J. INTELL. PROP. L. & PRAC. 689, 690–91 (2016) (describing purposive interpretation in the U.K.).

16. *Kirin-Amgen*, [2004] UKHL 46, [39].

17. *Id.* at [44]. See Paul Cole, *Letter to the Editor*, 87 J. PAT. & TRADEMARK OFF. SOC’Y 642, 643 (2005) (“However, according to Lord Hoffmann, what courts can do is to give the claim language an extended meaning. . . . Furthermore, construction of claims to cover new technology is clearly permissible.”). Cf. Sarnoff, *supra* note 6 at 1157 (2004) (“As under the European Patent Convention, any residual fairness concerns would be addressed better by nonliterally interpreting claim language than by applying the modern doctrine of equivalents.”). See generally Alexandra K. Pechtold, *The Evolution of the Doctrine of Equivalents in the United States, United Kingdom, and Germany*, 87 J. PAT. & TRADEMARK OFF. SOC’Y 412 (2005).

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

19. 35 U.S.C. § 112(f) (2018).

20. See *Warner-Jenkinson*, 520 U.S. at 27–28 (“Because § 112, ¶ 6, was enacted as a targeted cure to a specific problem, and because the reference in that provision to ‘equivalents’ appears to be no more than a prophylactic against potential side effects of that cure, such limited congressional action should not be overread for negative implications. Congress in 1952 could easily have responded to *Graver Tank* as it did to the *Halliburton* decision. But it did not.”) (citing *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605 (1950) and *Halliburton Oil Well Cementing Co. v. Walker*, 321 U.S. 1 (1946)). I have argued elsewhere that Congress also did not impliedly ratify *Graver Tank*’s creation of a doctrine of equivalents extending protection beyond the scope of application of construed claim language. See Joshua D. Sarnoff, *The Historic and Modern Doctrines of Equivalence and Claiming the Future: Part II (1870-1950)*, 87 J. PAT. & TRADEMARK OFF. SOC’Y 441, 483–90 (2005) [hereinafter Sarnoff, *DOE Part II*]. Thus, courts remain free to restore the doctrine

claim meaning and application scope from applying to after-arising technologies *may* raise concerns regarding a possible conflict with the pioneering invention (or pioneering patent) doctrine. That doctrine was based on the lack of prior art to restrict claim meaning and application scope that would otherwise invalidate broad claims.²¹ But the pioneering invention doctrine could be understood to authorize the use of broad claiming language that is *intended* to (or that may be construed to) apply literally to after-arising technology that was not earlier recognized as a claim embodiment. It is unclear whether the pioneering invention doctrine remains in force (and *In re Hogan* did not ultimately reach that issue²²); if it permits claiming after-arising technology, it would then break the axiomatic equivalency of claim scope for validity and literal infringement. To the extent that such future-regarding claiming language is authorized explicitly or by construction of language that has no temporal limitation, such claims under current law would clearly reach beyond the scope of the disclosed invention enabled at the time of filing and “possessed” by the applicant.²³ Such claims should thus be invalid under current validity

to its historic role of defining the scope of claim application however broadly or narrowly, literally or liberally, the claim language is construed. See Joshua D. Sarnoff, *The Historic and Modern Doctrines of Equivalence and Claiming the Future, Part I (1790-1870)*, 87 J. PAT. & TRADEMARK OFF. SOC'Y 371, 391–97 (2005).

21. See, e.g., 35 U.S.C. §§ 102, 103 (2018); *Tex. Instruments, Inc. v. U.S. Int'l Trade Comm'n*, 805 F.2d 1558 (1986), *reh'g denied*, 846 F.2d 1369, 1370 (Fed. Cir. 1988) (arguing that the “liberal” construction of pioneering invention claims “is not a manifestation of a different legal standard based on an abstract legal concept denominated ‘pioneer.’ Rather, the ‘liberal’ view flows directly from the relative sparseness of prior art in nascent fields of technology.”) (quoting *Morley Sewing Mach. Co. v. Lancaster*, 129 U.S. 263, 286 (1889)). See also *Brothers v. United States*, 250 U.S. 88, 89 (1919); *McCormick v. Talcott*, 61 U.S. 402, 404–08 (20 How. 1857).

22. See, e.g., *In re Hogan*, 559 F.2d 595, 606 (C.C.P.A. 1977) (“Though we do not reach the point on this appeal, we note appellants’ argument that their invention is of ‘pioneer’ status.”); Brian J. Love, *Interring the Pioneer Invention Doctrine*, 90 N.C. L. REV. 379, 382–83 (2012) (discussing *Tex. Instruments, Inc.* and the “[c]onventional wisdom . . . that the [pioneering invention patent] doctrine was killed more than twenty years ago.”); John R. Thomas, *The Question Concerning Patent Law and Pioneer Inventions*, 10 HIGH TECH. L.J. 35, 52 (1995) (“[I]n one sense the doctrine of equivalents remedies the anomaly in the law that exists whenever a pioneer patent is not literally infringed by the very subject matter which was spawned by the disclosure of that pioneer patent.”). Cf. *Hogan*, 559 F.2d at 610 (Miller, J., concurring) (“Contrary to the majority opinion, to permit the ‘outer boundaries’ of a claim to be construed in light of later art, rather than in light of art at the time the patent application was filed, could well impede progress in the useful arts.”).

23. See authority cited *supra* note 13 and accompanying text. Cf. Love, *supra* note 22, at 384 (assuming the expansion of claim meaning over time, either by construction or reissue; “claims [for pioneer inventions] will naturally expand with time as technical terminology evolves and hindsight bias takes effect.”); Sarnoff, *supra* note 6, at 1157 (“The Supreme Court or Congress also may need to impose additional limits on the ability to claim later-arising technologies for patent law to serve its constitutional purpose of promoting progress.”).

doctrines, unless the axiomatic equivalency of validity and literal infringement scope is to be broken.

Resolving these tensions will require rethinking (at some point) the permissible scope of claiming and the role of the doctrine of equivalents and the pioneering invention doctrine.²⁴ This Article, however, simply emphasizes that the best understanding of the current law in the U.S. is that claims may *not* apply to after-arising technologies for literal infringement purposes. Claims employing language that *expressly* seeks to cover future but constructively unknown embodiments should be held invalid as lacking both enablement and written description support, and thus cannot be infringed. And under current claim construction doctrine, claim language that is ambiguous regarding such future application scope should be construed not to encompass after-arising technology so as to preserve claim validity.²⁵ Thus, we may be stuck for the foreseeable future in the U.S. with the doctrine of equivalents as the sole means to provide protection for after-arising equivalent technologies. And other countries including the U.K. now face the same questions.²⁶

In Part II, I discuss the common (but not universal) wisdom that claim meaning and application scope permissibly may expand to cover after-arising technology for literal infringement purposes. I demonstrate that the common wisdom is based on conflicting Federal Circuit precedents that fail to follow the earliest panel precedent *Schering*. The goal is to bring the conflicts to light, so that a proper understanding of the current law may be applied or, alternatively, the law may be changed.

24. Compare, e.g., Samoff, *supra* note 6, at 1213 (“[I]f any additional protection beyond the scope of application of the literal meaning of claim limitations were thought to be necessary, nonliteral claim construction should be a preferable alternative to the modern doctrine. . . . The facts of the *Festo* case provide a concrete example of why literal interpretation should be preferred, and why nonliteral interpretation would be a better alternative than the modern doctrine to remedy (mistakenly) perceived unfairness.”), with England, *supra* note 15, at 697 (applicants “cannot be expected to predict what future technological developments might be made. . . . However, in practice, despite the above recognition of a doctrine of equivalents, many courts have to a large degree moved towards an approach that places claim language at the center of the infringement analysis and in which the application of the doctrine of equivalents is something of a last resort to avoid an inequitable result.”).

25. See *Phillips v. AWH Corp.*, 415 F.3d 1303, 1327–28 (Fed. Cir. 2005) (en banc) (“While we have acknowledged the maxim that claims should be construed to preserve their validity, we have not applied that principle broadly” where “the claim term at issue is not ambiguous.”) (citing *Klein v. Russell*, 86 U.S. (19 Wall.) 433, 466 (1873)).

26. I am, however, now more sympathetic to the temporal limitation problem that, at its core, the modern doctrine of equivalents addresses. My increased sympathy for the doctrine of equivalents may provide a useful lesson about, if not an antidote to, the increasing pressures for and tendencies of (particularly younger) scholars to publish more frequently and quickly, without taking adequate time to really learn the entire history and without spending even more time and effort—rather than less and less—to fully consider that history and how their proposals relate to it.

In Part III, I explain why, as the earliest panel precedent, the *Schering* case controls the current doctrine and, therefore, why claims may not apply to after-arising technologies for literal infringement purposes. *Schering* clearly held that literal claim meaning and application scope cannot extend to after-arising technologies, while also suggesting that claims would be invalid as lacking written description support if they did. I also discuss in more detail the critical precedents that followed *Schering*, some of which generated the conflicting views discussed in Part II without even citing *Schering*, much less attempting to distinguish its precedent. But even if these later cases were somehow thought to control the issue of literal infringement by after-arising technologies, then such claims should simply be held invalid under the en banc *Ariad Pharmaceuticals* written description precedent, and thus would be incapable of being infringed.

In Part IV, I briefly explain why Congress in 1952 may be thought to have precluded claim language from applying to after-arising technologies for literal infringement purposes. Specifically, in the predecessor to § 112(f), Congress mandated a specific interpretive rule for *functional* claiming language.²⁷ That rule has been interpreted by the Federal Circuit for literal infringement purposes to temporally limit claim scope to technologies known-to-be equivalent to disclosed claim embodiments as of the filing date and that perform the identical function claimed.²⁸ Although *structural* claiming language is not formally subject to the interpretive rule of § 112(f), the failure to temporally limit structural claim term meanings to temporally fixed embodiments then requires functional determinations to assess the scope of application of such structural meanings.²⁹ Thus, permitting structural claim meaning and application scope to apply to equivalent after-arising technologies that were not constructively recognized by skilled persons to be claim embodiments by the filing date *effectively converts* structural claiming language into functional claiming language. And then, such structural claiming language should be subject to the same § 112(f) temporal limitation rule for literal infringement that currently applies to explicitly functional claiming language.³⁰

27. 35 U.S.C. § 112(f) (2018).

28. *See Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus., Inc.*, 145 F.3d 1303, 1310 (Fed. Cir. 1998).

29. *Cf. Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1350 (Fed. Cir. 2015) (relevant portion en banc) (discussing purportedly structural terms that require determination of whether allegedly infringing things “perform[] a specified function”); *id.* at 1351 (“[T]he fact that one of skill in the art could program a computer to perform the recited functions cannot create structure where none otherwise is disclosed.”).

30. *See, e.g., id.* at 1349–51 (discussing “nonce words”).

II. CONFUSION OVER WHETHER LITERAL INFRINGEMENT CLAIM MEANING OR APPLICATION SCOPE MAY EXPAND OVER TIME TO AFTER-ARISING TECHNOLOGIES.

As Professor Donald Chisum put it in his leading treatise, “[t]he time framework for construing patent claims is the subject of surprisingly sparse judicial authority.”³¹ Yet many practical treatises and academic works indicate that claim meaning (or the scope of application of that meaning) either (1) *may* expand over time to encompass after-arising technologies for literal infringement purposes or (2) *may not* do so. They arrived at those conclusions based on conflicting case law. This is true even though the courts and commentators uniformly treat claim meaning and application scope as temporally fixed for validity purposes.

In regard to *validity*, Professor Chisum noted one decision of the Supreme Court that focused on the *filing date* for definiteness and noted various decisions of the Federal Circuit alternatively focusing on the filing date or the *date of invention*.³² Specifically, in *Nautilus Inc. v. Biosig Instruments, Inc.*,³³ the Supreme Court stated that “[d]efiniteness is measured from the viewpoint of a person skilled in [the] art *at the time the patent was filed*.”³⁴ In discussing this decision, Professor Chisum noted:

The Court was not addressing the issue of the filing date versus the invention date. Rather, the Court was rejecting the position that claim definiteness could be assessed from a *later*, post-filing date, claim-construction perspective. However, because definiteness is closely linked to claim construction, the *Nautilus* statement tended to support the view that the filing date should control.³⁵

When reviewing earlier Federal Circuit *validity* decisions in regard to the timing of claim construction and application scope, Professor Chisum concluded:

The enablement and written disclosure requirements [particularly *In re Hogan*], which provide essential support for a patent’s claims, are measured according to the patent’s effective application filing date. It would seem to follow that, to the extent that the meaning of a patent claim depends on the state of the art or on tests, standards or measurements established in the art, the time framework should be the

31. 5A DONALD S. CHISUM, CHISUM ON PATENTS § 18.03(2)(g) (2020) [hereinafter CHISUM ON PATENTS] (discussing “Time Framework”).

32. *See, e.g., id.*

33. *Nautilus Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898 (2014).

34. *Id.* at 908 (citations omitted).

35. CHISUM ON PATENTS, *supra* note 31, at § 18.03(2)(g).

filing date. Nevertheless, Federal Circuit decisions have stated, without analysis, that the relevant date is the date of invention, which is only presumed to be the application filing date.³⁶

In contrast, when discussing the temporal frame for *literal infringement* claim meaning and application scope, Professor Chisum did not draw any clear conclusions but simply described the various Federal Circuit cases and their holdings.³⁷ Professor Chisum started by describing *Schering Corp. v. Amgen, Inc.*,³⁸ and then discussed subsequent cases such as *Kopykake Enterprises, Inc. v. Lucks Co.*³⁹ and *SuperGuide Corp. v. DirecTV Enterprises, Inc.*⁴⁰ He also discussed in footnotes various additional cases, such as *Plant Genetic Systems, N.V. v. DeKalb Genetics Corp.*,⁴¹ *Chiron Corp. v. Genentech, Inc.*,⁴² and *Innogenetics, N.V. v. Abbott Laboratories.*⁴³

These cases, however, reached different results in regard to whether claim meaning or application scope for literal infringement purposes can apply to after-arising technologies. For example, in *Kopykake Enterprises*, the court relied upon *Schering* to hold that “when a claim term understood to have a narrow meaning when the application is filed later acquires a broader definition, the literal scope of the term is limited to what it was understood to mean at the time of filing.”⁴⁴ In contrast, in *Innogenetics, N.V.*, the court relied upon *Superguide* to hold that “[o]ur case law allows for after-arising technology to be captured within the literal scope of valid claims that are drafted broadly enough.”⁴⁵

36. *Id.*

37. However, in a separate section on adequacy of disclosure, Professor Chisum notes that “[t]he state of the art as of the filing date is used to determine whether the scope of a claim is commensurate with the scope of the disclosure in the specification.” 3 CHISUM ON PATENTS, *supra* note 31, at § 7.03(3)(a)(ii). Professor Chisum also discusses there various timing cases, including *In re Hogan*, 559 F.2d 595 (C.C.P.A. 1977), *Plant Genetic Sys., N.V. v. DeKalb Genetics Corp.*, 315 F.3d 1335 (Fed. Cir. 2003), and *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247 (Fed. Cir. 2004). CHISUM ON PATENTS, *supra* note 31, at § 7.03(3)(a)(ii). *See id.* (noting that the Federal Circuit in *Plant Genetic Systems* rejected the argument that “‘pioneer’ status would entitle a patent to a ‘lower enablement requirement’” that would justify broad claims without sufficient disclosure).

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

39. *Kopykake Enters., Inc. v. Lucks Co.*, 264 F.3d 1377 (Fed. Cir. 2001).

40. *SuperGuide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870 (Fed. Cir. 2004).

41. *Plant Genetic Sys., N.V. v. DeKalb Genetics Corp.*, 315 F.3d 1335, 1335 (Fed. Cir. 2003).

42. *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247, 1247 (Fed. Cir. 2004).

43. *Innogenetics, N.V. v. Abbott Labs.*, 512 F.3d 1363 (Fed. Cir. 2008). *See also* CHISUM ON PATENTS, *supra* note 31, at § 18.03(2)(g).

44. *Kopykake Enters., Inc. v. Lucks Co.*, 264 F.3d 1337, 1383 (Fed. Cir. 2001) (citing *Schering Corp. v. Amgen, Inc.*, 222 F.3d 1347, 1352–54 (Fed. Cir. 2000)).

45. *Innogenetics, N.V.*, 512 F.3d at 1371–72 (quoting *SuperGuide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870, 878–80 (Fed. Cir. 2004)).

Although Professor Chisum did not discuss in this context the seminal, en banc *Phillips v. AWH Corp.*⁴⁶ literal infringement claim construction *methodology* case, the Federal Circuit held in that case that claims should receive their “ordinary and customary” meaning for literal infringement purposes; that meaning “is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the *effective filing date of the patent application*.”⁴⁷ As with the Supreme Court in *Nautilus*, however, the Federal Circuit in *Phillips* was not focused on the distinction of an earlier invention date from the filing date but rather on concerns for an excessive scope by relying on dictionary definitions that might include inappropriately broad (including later-developed) meanings.⁴⁸

The *Phillips* language and the conflicts among these cases are all the more remarkable given that, as Professor Chisum noted, in cases such as “*PC Connector Solutions LLC v. SmartDisk Corp.* (2005),⁴⁹ the Federal Circuit emphasized that ‘[a] claim cannot have different meanings at different times.’ . . . [I]ts meaning must be interpreted as of its effective filing date.”⁵⁰ Further, the court in *PC Connector Solutions* cited to another important en banc Federal Circuit decision on claim construction for literal infringement, *Markman v. Westview Instruments, Inc.*⁵¹ *Markman* similarly referred to what a skilled artisan would understand the claim term to mean “at the time of the invention.”⁵² Nevertheless, nothing in the en banc *Phillips* and *Markman* decisions therefore suggests that claim meaning or application scope encompasses technologies arising after the effective filing date of the relevant claim language.

In contrast to Professor Chisum, in 2005 Professor Mark Lemley (in an important article cited by Chisum) directly addressed the changing temporal reference frame sometimes given to claim term meanings by the

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

47. *Id.* at 1312–13 (quoting *Vitronics Corp. v. Conceptionics, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996) and citing *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1116 (Fed. Cir. 2004)) (emphasis added). *Cf. Innova/Pure Water, Inc.*, 381 F.3d at 1116 (“A court construing a patent claim seeks to accord a claim the meaning it would have to a person of ordinary skill in the art *at the time of the invention*.”) (emphasis added).

48. *See Phillips*, 415 F.3d at 1321 (“The main problem with elevating the dictionary to such prominence is that it focuses the inquiry on the abstract meaning of words rather than on the meaning of claim terms within the context of the patent.”). *Cf. CHISUM ON PATENTS*, *supra* note 31, at § 18.03(2)(g).

49. *PC Connector Sols. LLC v. SmartDisk Corp.*, 406 F.3d 1359 (Fed. Cir. 2005).

50. *CHISUM ON PATENTS*, *supra* note 31, at § 18.03(2)(g) (quoting *PC Connector Sols.*, 406 F.3d at 1363).

51. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967 (Fed. Cir. 1995) (en banc).

52. *PC Connector Sols.*, 406 F.3d at 1363 (quoting *Markman*, 52 F.3d at 986).

Federal Circuit.⁵³ As usual, Professor Lemley cogently summarized the common wisdom that had developed by that time regarding temporally expanding claim meaning for literal infringement purposes. And Professor Lemley stated, based on the case law, such changing temporal meanings *may* sometimes include after-arising technologies as claim embodiments for literal infringement purposes:

It is a fundamental principle of patent law that the time as of which we determine the *meaning* of claim terms *varies* depending on what legal rule is at issue. . . . And where the question involves alleged infringement of the patent, courts evaluate infringement *in at least some circumstances* based on the *meaning* of the claim *at the time of infringement*.⁵⁴

Similarly, the leading patent law textbook authors, Professors Robert Merges and John Duffy, have explained that for literal infringement purposes courts do not fix the *meaning* of claim terms as of the filing date, but rather as of the time of infringement.⁵⁵ In explaining how improvement patents for non-obvious after-arising technologies can infringe without rendering the underlying patent invalid for lack of enablement, the authors noted that although:

the enablement inquiry is forever pegged to the time of application filing . . . *for purposes of infringement, however, the coverage of the claim is determined at the time of the alleged infringement*. . . . For infringement purposes, the phrase will be interpreted as of a later date. If the improvement is a “fuzzball” *as the term was understood* at that later date, then it infringes.⁵⁶

The textbook authors justify the differential treatment of claim term *meanings* as fixed for enablement and as expanding over time for infringement based on seminal theoretical work addressing after-arising

53. See CHISUM ON PATENTS, *supra* note 31, at § 18.03(2)(g) n.961 (citing Mark A. Lemley, *The Changing Meaning of Patent Claim Terms*, 104 MICH. L. REV. 101 (2005)).

54. Lemley, *supra* note 53, at 102–03 (last emphasis in original). See also *id.* at 108 n.31 (discussing *Laser Alignment, Inc. v. Woodruff & Sons, Inc.*, 491 F.2d 866 (7th Cir. 1974)). Cf. *id.* at 104 n.12, 116 n.59, 118 n.72 (identifying the *Schering* case in three footnotes without expanding on the decision in detail); Dan L. Burk & Mark A. Lemley, *Fence Posts or Sign Posts? Rethinking Patent Claim Construction*, 157 U. PA. L. REV. 1743, 1757 (2009) (citing and discussing *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247, 1257 (Fed. Cir. 2004) and *SuperGuide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870, 896 (Fed. Cir. 2004), without citing *Schering Corp. v. Amgen, Inc.*, 222 F.3d 1347 (Fed. Cir. 2000)).

55. See generally ROBERT PATRICK MERGES & JOHN FITZGERALD DUFFY, *PATENT LAW AND POLICY CASES AND MATERIALS* (7th ed. 2017).

56. *Id.* at 274–75 (emphasis added).

technology by Professor Kevin Collins.⁵⁷ Collins's work is well worth reading on its own, but for present purposes regarding common beliefs about the state of the law, Professor Merges and Duffy summarize Collins's approach as follows:

According to Collins, claim meaning for purposes of enablement is defined with reference to all those possible embodiments defined by the claims on the patent's filing date. For these purposes, claim meaning involves a mapping between the words of the claim and a class of actual, physical objects. This type of meaning is known as denotational meaning. By contrast, for purposes of infringement meaning is better described in terms of relationships among words. Meaning establishes a stable matrix of concepts that clarifies where one word stands with respect to other words; this type of meaning is called ideational meaning. The distinction between denotational meaning is fixed with respect to physical embodiments (or things in the world), while ideational meaning is not. . . . For purposes of enablement, meaning has a fixed, temporal aspect, defined by things in the world on the date the meaning is fixed. For infringement, meaning is not fixed in this way. Things that are described by words may change without the meaning of the word itself changing. Meaning for enablement is time-dependent . . . meaning for infringement is not (it is independent of the number and type of things in the world at a given time).⁵⁸

Just prior to Collins's work, in 2004, I explained why I thought that the courts had failed to recognize that temporally fixed meanings might have different temporal scopes of application (embodiment scopes), as a result of increasing knowledge in the art regarding what things in the world met that fixed meaning. I also analyzed the various relevant and conflicting cases to explain that the Federal Circuit had alternately held that claim meaning *may* expand over time for infringement scope so as to apply to after-arising technologies, and that claim meaning *may not* expand over time for infringement scope.⁵⁹ And although I mentioned the

57. See Collins, *supra* note 3.

58. MERGES & DUFFY, *supra* note 55, at 275–77. Cf. Joshua D. Sarnoff & Edward D. Manzo, *An Introduction to, Premises of, and Problems With Patent Claim Construction*, in PATENT CLAIM CONSTRUCTION IN THE FEDERAL CIRCUIT § 1.4 n.20 (E. Manzo ed. 2019) (“[T]he level of generality (or ‘granularity’) matters to what is considered equivalent, and the scope of things encompassed by a temporally fixed meaning may actually expand over time (depending on the type of linguistic meaning referred to—‘ideational’ meaning or ‘denotational’ meaning—that is considered to be fixed.”) (citing Collins, *supra* note 3, at 500). *But cf. infra* notes 136–37 and accompanying text (discussing intentional and extensional definitions of the meaning of terms).

59. See Sarnoff, *supra* note 6, at 428–32 (citing and discussing *Chiron Corp.*, 363 F.3d at 1257, *SuperGuide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870, 896 (Fed. Cir. 2004), and *Plant Genetic Sys., N.V. v. DeKalb Genetics Corp.*, 315 F.3d 1335, 1340 (Fed. Cir. 2003)).

Schering precedent in the context of claim amendments and changing application scope, I did not then explain why I believed that *Schering* controlled the issue (as the earliest panel precedent) and precluded literal infringement from encompassing after-arising technologies.⁶⁰

In contrast, in 2005, Professor Christopher Cotropia relied upon *Schering* to suggest that claim meaning and application scope *may not* expand over time for literal infringement purposes to encompass after-arising technologies. As he stated:

[t]he court in *Hogan* did not specifically hold that claim language can literally include after-arising technologies. In fact, the weight of Federal Circuit authority indicates the opposite, as discussed above and exemplified by the *Schering* decision. Thus, recent case law has emphasized the temporal limitation on literal claim meaning, prohibiting the literal capture of later-developed technologies.⁶¹

In summary, the academic literature and court cases are in conflict over the ability of claim meaning or application scope to expand over time for purposes of literal infringement. This is true even though the cases generally establish both a fixed temporal meaning and application scope for *validity* purposes, and even though many cases explicitly state that claim meaning and application scope do not vary for validity and for literal infringement purposes.⁶² Given these conflicts and the fact that the leading commentators generally treat claim *meaning* to be interpreted at the time of infringement, and thus claims may permissibly expand their scope over time for purposes of literal infringement, many practitioners likely assume that this is the law. But it is not. Accordingly, it is long overdue to correct that misperceived but common wisdom.

60. *See id.* at 432 n.147 (citing *Schering Corp. v. Amgen Inc.*, 222 F.3d 1347 (Fed. Cir. 2000)).

61. Christopher A. Cotropia, “*After-Arising*” *Technology and Tailoring Patent Scope*, 61 N.Y.U. ANN. SURV. AM. L. 151, 167–68 (2005).

62. Similar conflicts now are arising under United Kingdom law, given adoption of the doctrine of equivalents and the separation of purposive interpretation scope for validity and infringement scope under the doctrine of equivalents. *See* Antony Craggs, *News from Abroad – Technetix v. Teleste: Doctrine of Equivalents*, PATENT DOCS (June 11, 2019), <https://www.patentdocs.org/2019/06/news-from-abroad-technetix-v-teleste-doctrine-of-equivalents.html> [<https://perma.cc/TQA9-L4N6>] (“As validity was not in issue in the case, however, the nexus between validity and the doctrine of equivalents was not addressed. This was a particularly acute issue because English law, prior to *Actavis v. Lilly*, conflated the test of novelty and infringement, namely a claim lacked novelty if the prior publication disclosed subject-matter which, if performed, would necessarily infringe the claim. In essence, the test for novelty elided construction with infringement, with the latter now including the doctrine of equivalents.”).

III. UNDER CURRENT FEDERAL CIRCUIT LAW, LITERAL CLAIM MEANING AND APPLICATION SCOPE MAY NOT EXTEND TO AFTER-ARISING TECHNOLOGIES.

It is uncontested that neither claim meaning nor claim application scope may expand over time for *validity* purposes. This was clearly established in 1977 by the Court of Customs and Patent Appeals in the famous *In re Hogan* case.⁶³ The court held in *Hogan* that claim meaning for enablement *could not* be construed based on later-developed meanings in the art for claim terms, and that after-arising technologies that would embody such expanded meanings (relative to the meaning as of the effective filing date) should not be held to invalidate claims for lack of enablement.⁶⁴ But *Hogan* expressly did not reach the question of whether such claim meanings could be construed for *literal infringement* purposes based on the later-developed meanings of claim terms.⁶⁵ Judge Miller in *Hogan* concurred separately and expressly to address that issue, and to suggest that claim terms could not and should not be construed based on later meanings for literal infringement purposes.⁶⁶

As Professor Cotropia noted in 2005, however, claims may employ broad terminology that is not limited to particular structures known at a particular time to embody those terms (thereby effectively employing functional language). To construe those terms to cover after-arising

63. See *In re Hogan*, 559 F.2d 595, 604 (C.C.P.A. 1977). See, e.g., Lemley, *supra* note 53, at 106–07 (also citing *Plant Genetic Sys., N.V.*, 315 F.3d at 1340).

64. See *Hogan*, 559 F.2d at 605–07; see also *id.* at 606 (“To now say that appellants should have disclosed in 1953 the amorphous form which on this record did not exist until 1962, would be to impose an impossible burden on inventors and thus on the patent system. . . . Consideration of a later existing state of the art in testing for compliance with § 112, first paragraph, would not only preclude the grant of broad claims, but would wreak havoc in other ways as well.”).

65. See *id.* at 607 (explaining the U.S. Patent and Trademark Office’s (PTO’s) concern that permitting the claim “might lead to enforcement efforts against the later developers. Any such conjecture, if it exists, is both irrelevant and unwarranted. The business of the PTO is patentability, not infringement.”).

66. *Id.* at 610 (Miller, J., concurring) (“Contrary to the majority opinion, to permit the ‘outer boundaries’ of a claim to be construed in light of later art, rather than in light of art at the time the patent application was filed, could well impede progress in the useful arts. . . . The majority opinion notes . . . that any conjecture on this point [of potential broader infringement scope] is ‘both irrelevant and unwarranted,’ [But] the majority opinion advocates a double standard: for the inventor, interpret the language of the claims against later developers in light of the later state of the art; but for the PTO, as held here, interpret such language against the inventor only in light of the state of the art at the time the application was filed. I do not agree that such a double standard is needed to spur invention.”). Cf. *Plant Genetic Sys., N.V.*, 315 F.3d at 1341 (stating that the discussion of pioneer patents in *Hogan* was “extended dicta”) (quoting *Hogan*, 559 F.2d at 610 (Miller, J., concurring) and citing *Hogan*, 559 F.2d at 606); *id.* (“We do not need to address all of the insightful comments made by the concurring judge; it is sufficient for the present case that we hold the district court did not err in not applying *Hogan*’s dicta to its enablement analysis.”).

technologies would not only generate enablement concerns, it would invariably result in a written description problem and add prohibited “new matter” to the application.⁶⁷ The Federal Circuit in the en banc *Ariad Pharmaceuticals* case later impliedly affirmed this understanding, i.e., that claim scope must be limited to (at least constructively) known embodiments as of the date of application filing.⁶⁸ If after-arising technologies were included within claim meaning for validity scope, the claims should necessarily fail the possession test, which requires an objective disclosure that would demonstrate to a person of ordinary skill that the applicant mentally recognized and possessed the *full scope* of the claimed invention. As the court stated in *Ariad*:

a generic claim may define the boundaries of a vast genus of chemical compounds, and yet the question may still remain whether the specification, including original claim language, demonstrates that the applicant has invented species sufficient to support a claim to a genus. . . . [In *Regents of the University of California v. Lilly*,⁶⁹ w]e held that a sufficient description of a genus instead requires the disclosure of either a representative number of species falling within the scope of the genus or *structural features common to the members of the genus so that one of skill in the art can ‘visualize or recognize’ the members of the genus.*⁷⁰

In regard to claim meaning and application scope for *literal infringement* purposes, the Federal Circuit’s 2000 decision in *Schering Corp. v. Amgen Inc.*⁷¹ appears to be the first Federal Circuit case directly addressing after-arising technologies, and therefore establishes the law unless and until overturned en banc. Nevertheless, *Schering* was then followed by other cases alternatively corroborating and conflicting with

67. See Cotropia, *supra* note 61, at 165 (“The claims can be drafted to literally describe technology not yet known, as demonstrated above. But the claims technically 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. ‘In fact, the quintessential example of an enforceable equivalent, after-arising technology, would always be unclaimable new matter’ for the patent as filed.”) (citation omitted); see also 35 U.S.C. § 132(a) (2018).

68. *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1350–51 (Fed. Cir. 2010) (en banc).

69. *Regents of the Univ. of Cal. v. Eli Lilly & Co.*, 119 F.3d 1559, 1568–69 (Fed. Cir. 1997).

70. *Ariad Pharm.*, 598 F.3d at 1349–50 (quoting *Regents of the Univ. of Cal.*, 119 F.3d at 1568–69) (emphasis added). Cf. *Plant Genetic Sys., N.V. v. DeKalb Genetics Corp.*, 315 F.3d 1335, 1340–41 (Fed. Cir. 2003) (“We do not read *Hogan* as allowing an inventor to claim what was specifically desired but difficult to obtain at the time the application was filed, unless the patent *discloses* how to make and use it.”) (emphasis added).

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

its holding.⁷² I briefly discuss these cases in more detail below. However, it bears noting that the academic commentary also sometimes refers to a non-precedential 1974 case from the Seventh Circuit, *Laser Alignment, Inc. v. Woodruff & Sons, Inc.*⁷³ And the academic commentary largely (and properly) ignores dicta in the 1977 Court of Claims *Lockheed Aircraft v. United States* case that might suggest that claims may be literally infringed by after-arising technologies,⁷⁴ treating that case as a means-plus-function case subject to the temporal limitation rule, as well as actually addressing equivalents that were known in the art at the time of filing.⁷⁵

72. See, e.g., CHISUM ON PATENTS, *supra* note 31, at § 18.03(2)(g); Lemley, *supra* note 53, at 104, 108–10; Burk & Lemley, *supra* note 54, at 1757.

73. *Laser Alignment, Inc. v. Woodruff & Sons, Inc.*, 491 F.2d 866 (7th Cir. 1974). See, e.g., Lemley, *supra* note 53, at 108 n.31. Federal Circuit precedents that cite the case do not address its discussion of after-arising technologies. See, e.g., *Coleco Indus. v. U.S. Intern. Trade Com'n*, 573 F.2d 1247, 1257 n.9 (C.C.P.A. 1978).

74. *Lockheed Aircraft Corp. v. United States*, 553 F.2d 69, 79–80, 83–84 (Ct. Cl. 1977) (“Having determined that the claims in issue are entitled to a broad range of equivalents, the claims must next be read upon the accused device. As fully set forth in the findings, using claim 1 as a representative claim, *it is clear that claim 1 literally reads on the accused device*. The inquiry continues, however, for the accused device must additionally be shown to substantively infringe the claims by performing the same work, in substantially the same manner to achieve substantially the same result as the claimed device. . . . It is, of course, fundamental that a patentee need disclose only the best mode conceived by him for practicing the invention, not all conceivable modes. . . . [The inventor] was *not ‘personally familiar’ with pulse compression in 1954* and the patent in suit appropriately reflects what he conceived to be the best mode at that time. This does not vitiate equivalency. It has long been settled that infringement is not avoided by an equivalent that was not known at the time of the invention.”) (citing WALKER ON PATENTS § 417 (1917 & 1929 eds.)) (emphasis added). Similarly, in *d Co. of Am. v. United States*, 384 F.2d 391 (Ct. Cl. 1967), the discussion focused on not limiting claim construction to the best mode, absent any indication in the specification that the invention itself was limited to that disclosed embodiment. See *id.* at 399. Although the court upheld some findings of infringement by an after-arising technology, the decision did not focus on that question. Instead, it states that a “‘patentee’s broadest claim can be no broader than his actual invention,’” and, in the context of discussing prosecution history estoppel, that a patentee “cannot construe the claims narrowly before the Patent Office and later broadly before the courts.” *Id.* at 398–99. Further, in regard to many of the patent claims at issue, the court appears to have relied on the reverse doctrine of equivalents to avoid literal infringement, and where it found infringement did not explicitly discuss the after-arising nature of the technology. See *id.* at 403–14. Finally, the decision notes that the range of equivalents is broader for pioneer patents, but that in determining that range “[o]ne important guide is whether persons reasonably skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was.” *Id.* at 400 (citing *Graver Tank & Mfg. Co. v. Linde Air Prod. Co.*, 339 U.S. 605, 609 (1950)). But to the extent that it construed claims to include such after-arising technologies, the *Autogiro* decision would appear to violate the axiomatic equivalency of claim scope for infringement and validity and to be impliedly overruled by *Ariad Pharmaceuticals*.

75. See *Lockheed Aircraft Corp.*, 553 F.2d at 80–81 (discussing “means responsive” element of the claim); *id.* at 82 (citing *Graver Tank* and discussing known interchangeability for equivalency analysis); *id.* at 83–84 (focusing on the need to disclose only the best mode and that doing so does not vitiate equivalency); see also e.g., R. CARL MOY, MOY’S WALKER ON PATENTS § 4:87 n.9 (4th ed.

I am not aware of any Federal Circuit precedents decided between *Hogan* and *Schering Corp. v. Amgen, Inc.* that directly and explicitly held for literal infringement purposes that claim meaning may be construed at a later time than filing or that application scope of a temporally fixed meaning for claim terms may expand so as to treat after-arising technologies as claim embodiments.⁷⁶ None of the commentaries on the law recited in Part II refer to any such decision, nor to any Supreme Court decision directly on point.⁷⁷ Thus, it appears that *Schering* is the first

April 2017 on-line update) (explaining how the *Graver Tank* test was used in interpreting a means expression for literal infringement) (citing *Lockheed Aircraft*, 553 F.2d at 69); David Abraham, *In re Donaldson*, 76 J. PAT. & TRADEMARK OFF. SOC'Y 622, 624 (1994) ("The Federal Circuit has held [in *Lockheed Aircraft*] that elements known to be interchangeable to those of ordinary skill at the time the invention was made are deemed to have equivalent structure.") (citing, inter alia, *Lockheed Aircraft*, 553 F.2d at 82); JoAnne Rosenblum, *Patent Law—Doctrine of Equivalents—Has the Federal Circuit Dealt a Mortal Blow to the Doctrine of Equivalents?*, *Pennwalt Corporation v. Durand-Wayland, Inc.*, 833 F.2d 931 (*Fed. Cir.* 1987), 12 SUFFOLK TRANSNAT'L L.J. 671, 671 n.2 (1989) ("Courts have adopted the doctrine of equivalents to interpret patent claims liberally to cover a reasonable range of equivalent devices.") (citing *Lockheed Aircraft*, 553 F.2d at 79). And even if *Lockheed Aircraft* were somehow properly considered to have established an earlier panel precedent on literal infringement scope, the later en banc *Ariad* decision on written description implicitly overruled *Lockheed Aircraft*'s status as binding precedent given the axiomatic equivalency of validity and infringement scope and the invalidity of such claims. See authorities cited *supra* notes 10, 13 and accompanying text.

76. *Schering Corp. v. Amgen Inc.*, 222 F.3d 1347 (Fed. Cir. 2000). As noted above, however, one Seventh Circuit case held in 1974 that claim meaning and application scope may expand for literal infringement. See *Laser Alignment, Inc. v. Woodruff & Sons, Inc.*, 491 F.2d 866 (7th Cir. 1974). And one Court of Claims decision from 1977 also could be read to reach the same result, although its language actually suggests a doctrine of equivalents analysis was employed. See *Lockheed Aircraft Corp.*, 553 F.2d at 79 (the claim "should be accorded a broad and liberal interpretation so as to cover a reasonable range of equivalent devices performing substantially the same work in substantially the same manner to achieve substantially the same results as the claimed system read in light of the disclosed modes.").

77. Although the Supreme Court held in *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722 (2002), that patent infringement scope is not limited to literal claim meanings, it provided such protection under the doctrine of equivalents, and not by liberal claim construction that would expand claim meaning or application to embody after-arising technologies. See *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 731–32 (2002) ("The language in the patent claims may not capture every nuance of the invention or describe with complete precision the range of its novelty. If patents were always interpreted by their literal terms, their value would be greatly diminished. Unimportant and insubstantial substitutes for certain elements could defeat the patent, and its value to inventors could be destroyed by simple acts of copying. For this reason, the clearest rule of patent interpretation, literalism, may conserve judicial resources but is not necessarily the most efficient rule. The scope of a *patent* is not limited to its *literal* terms but instead embraces all *equivalents to the claims* described.") (citing *Winans v. Denmead*, 56 U.S. 330, 347 (15 How. 1853) (emphasis added). Similarly, although the Supreme Court in *Festo* referred to equivalents that were "unforeseeable at the time of amendment" when authorizing application of the doctrine of equivalents to such amended claims, nothing in the Court's discussion suggests that the meaning or application of the claim as originally filed or as amended could be expanded to reach such unforeseeable after-arising technologies for literal infringement purposes. *Festo Corp.*, 535 U.S. at 738.

Supreme Court or Federal Circuit precedent to directly address this issue. And *Schering* held that for literal infringement, claim meaning *may not* expand to embrace and application scope *may not* include after-arising technologies, simultaneously suggesting that the claims would be invalid for lack of written description if they did so.⁷⁸

In *Schering*, the claims were directed to a particular form of interferon, “interferon alpha,” or “IFN- α ,” originally identified in the specification as “leukocyte interferon,” but it was changed during prosecution to IFN- α because leukocytes had been determined to produce more than one kind of interferon and a committee of scientists adopted more precise terminology to reference the different forms. The district court had held that the change in terminology “imported years of scientific advance into the ‘901 patent’s disclosure and claims,” and prohibited those claims from being construed to include the later meaning under the “new matter” prohibition of § 132(a).⁷⁹ As a result, the district court dismissed the suit on *non-infringement* grounds and dismissed as moot arguments that the claims (by applying to after-arising technologies) were invalid.⁸⁰ In contrast, the Federal Circuit held that the substitution of terminology *did not and was not intended to incorporate such after-arising technologies* and further *limited the construction* of the claim term “IFN- α ” to the actual species of interferon that the applicant had discovered, conceived of, possessed, and disclosed (by deposit). Although one might try to read *Schering* as limited to claims where the applicant did not intend to claim after-arising technologies, the Court’s language was not so limited: “The term as used in the ‘901 patent, however, did not *and could not* enlarge the scope of the patent to embrace technology arising after its filing.”⁸¹ In other words, the claims were *required* to be construed for literal infringement purposes in light of what the applicant had actually invented, disclosed, and claimed at the time of filing its application.

Schering thus affirmed the non-infringement holding of the district court while *also* emphasizing that such temporal expansion of claim

78. I differ here slightly from Professor Cotropia’s statement that “[w]hile not addressing the question of after-arising equivalents directly, the Federal Circuit in *Schering* explains how a claim cannot literally cover later-developed technologies.” Cotropia, *supra* note 61, at 166. As explained below, both the district court and the Federal Circuit ruled on literal non-infringement grounds. *See* authorities cited *infra* notes 79–81 and accompanying text.

79. *Schering Corp. v. Amgen Inc.*, 222 F.3d 1347, 1352 (Fed. Cir. 2000).

80. *See Schering Corp. v. Amgen Inc.*, 35 F. Supp. 2d 375, 378 (D. Del. 1999) (“Judgment will be entered against Schering and in favor of Amgen on plaintiffs’ infringement claim. The Court will also dismiss without prejudice Amgen’s [invalidity] counterclaims as moot.”).

81. *Schering*, 222 F.3d at 1353 (emphasis added). *See id.* at 1353–54.

meaning would violate the written description doctrine.⁸² The court thus implicitly held, as it has repeated elsewhere, that it “is axiomatic that claims are [to be] construed the same way for both invalidity and infringement.”⁸³ Accordingly, *Schering* establishes the law in the Federal Circuit on whether after-arising technologies can literally infringe claims in the absence of controlling Supreme Court or later en banc Federal Circuit precedent.⁸⁴

The *Schering* case was decided earlier than either the conflicting *Superguide* case or the conflicting *Innogenetics* case, as well as before the *Kopykake*, *Plant Genetic Systems*, and *Chiron* cases that are consistent with *Schering*.⁸⁵ Perhaps unremarkably, the *Schering* case was neither relied on nor distinguished by—nor was it even cited in—the *Plant Genetic Systems*, *Chiron*, *SuperGuide*, or *Innogenetics* cases. And although the panel in *Schering* addressed an amended claim term added during prosecution, holding that it must be construed in the same manner as of the effective filing date of the original claim language, the same principal should apply to interpretation and construction of the meaning and application of originally filed claim language that is not amended.

In *Kopykake Enterprises, Inc. v. Lucks Co.*,⁸⁶ the Federal Circuit reaffirmed the holding in *Schering*, stating that “when a claim term understood to have a narrow meaning when the application is filed later acquires a broader definition, the literal scope of the term is limited to what it was understood to mean at the time of filing.”⁸⁷ This language clearly demonstrates the contemporaneous understanding that *Schering*

82. See *id.* at 1351–52 (discussing the district court’s holding that the substitution of later technological terminology imported new matter); *id.* at 1353–54 (“Because, at the time of the ‘901 application, neither Dr. Weissmann 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. The district court correctly concluded . . . that only one subspecies of alpha interferon was described and enabled in the specification.”) (citation omitted).

83. *Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1330 (Fed. Cir. 2003) (citing *W.L. Gore & Assocs., Inc.*, 842 F.2d 1275, 1279 (Fed. Cir. 1988)).

84. See, e.g., *Robert Bosch, LLC v. Pylon Mfg. Corp.*, 719 F.3d 1305, 1316 (Fed. Cir. 2013) (en banc) (“Panel opinions are, of course, opinions of the court and may only be changed by the court sitting en banc.”). See also *Deckers Corp. v. United States*, 752 F.3d 949, 964 (Fed. Cir. 2014) (citing *Robert Bosch*, 719 F.3d at 1316, *UMC Elecs. Co. v. United States*, 816 F.2d 647, 652 n.6 (Fed. Cir. 1987), *Kimberly-Clark Corp. v. Fort Howard Paper Co.*, 772 F.2d 860, 863 (Fed. Cir. 1985), and *Mother’s Rest., Inc. v. Mama’s Pizza, Inc.*, 723 F.2d 1566, 1573 (Fed. Cir. 1983)).

85. See authorities cited *supra* notes 40–43 and accompanying text. Cf. Sarnoff, *supra* note 6, at 430 n.141. And the Seventh Circuit case is not binding precedent in the Federal Circuit. *Laser Alignment, Inc. v. Woodruff & Sons, Inc.*, 491 F.2d 866 (7th Cir. 1974).

86. *Kopykake Enters., Inc. v. Lucks Co.*, 264 F.3d 1377 (Fed. Cir. 2001)).

87. *Id.* at 1383 (citing *Schering Corp. v. Amgen Inc.*, 222 F.3d 1347, 1352–54 (Fed. Cir. 2000)).

established a clear precedent on the issue and was not limited to the facts of the case and the applicant's intent. In *Kopykake Enterprises*, the district court had found the claim term "screen printing" that was at issue should be construed broadly to cover "conventional" methods of applying images but that it did not apply to ink-jet printing methods for printing shapes on edible bases, as ink-jet printing was only emerging for printing on paper and was not "commonplace" for foodstuffs at the time of filing.⁸⁸ The Federal Circuit rejected arguments that the prosecution history had disclaimed ink-jet printing. It held that the claim term should be understood broadly in light of the specification's reference to "conventional printing processes" for foodstuffs, and affirmed the district court that although ink-jet printing was known (and cited in the prosecution record), it was not then conventional for foodstuffs and the claim would not have been understood in the art at the time of filing to include it.⁸⁹

In *Plant Genetic Systems, N.V. v. DeKalb Genetics Corp.*,⁹⁰ the Federal Circuit avoided reaching the question of whether the claim construction should include after-arising technology based on amendments made to the claim during prosecution (to avoid an enablement rejection) that excluded such technology. Specifically, the applicant had added the terms "'susceptible to infection and transformation by Agrobacterium and capable of regeneration' of the plant and seed claims."⁹¹ The district court construed that language from the perspective of a skilled practitioner as excluding monocot plants and cells (such as the allegedly infringing genetically modified corn) because the specification did not disclose methods for such transformation and the state of the art as of the filing date did not supply evidence that such viable transformation could be accomplished in monocots.⁹² The Federal Circuit affirmed the construction based on the prosecution history but also stated in dicta that "when a claim term understood to have a narrow meaning when the application is filed later acquires a broader definition, the literal scope of the term is limited to what it was understood to mean at the time of filing."⁹³

88. *See id.* at 1379–80.

89. *Id.* at 1382–84. *Kopykake* thus did not address after-arising technology but rather "nascent" technology, although not yet commonplace in the specific technological field. *See* authorities cited *infra* note 100 and accompanying text.

90. *Plant Genetic Sys., N.V. v. DeKalb Genetics Corp.*, 315 F.3d 1335 (Fed. Cir. 2003).

91. *Id.* at 1344.

92. *See id.* at 1345.

93. *Id.* (citing *Kopykake Enters.*, 264 F.3d at 1383).

The Federal Circuit also sustained the district court's invalidity determinations of lack of enablement for certain cell claims that were conceded to include stably-transformed monocots, which were then known but "difficult to produce," rejecting arguments that the district court should have made findings regarding whether such claims should receive "pioneering status."⁹⁴ As the court stated:

PGS concedes that the cell claims cover monocot cells. Only by doing so can PGS sue DeKalb, which makes monocot products, for infringement. Having agreed that the cell claims encompass monocot cells, a later development, PGS' reliance on *Hogan* ignores the validity-infringement differentiation *Hogan* made.⁹⁵

Further, the court rejected arguments for broader scope for the enablement inquiry based on *Hogan*'s statement that "pioneering inventions 'deserve broad claims to the broad concept,'" noting that *Hogan*'s discussion of pioneering status was "extended dicta."⁹⁶

In *Chiron Corp. v. Genetech, Inc.*,⁹⁷ the Federal Circuit held that claims construed broadly to include after-arising technology—in a later-filed application claiming priority to an earlier application and thus to an earlier state of the art (which claims were improperly found by a jury to lack enablement because of after-arising technology)—actually lacked written description priority support in the earlier filed application and were thus invalid.⁹⁸ As the claim was invalid, there was no need for the court to review the propriety of the district court's claim construction for literal infringement purposes, which had included the after-arising technology within the scope of application of the later-application's claim meaning. Specifically, the claims issuing from the 1986 patent application were construed by the district court to cover both humanized and chimeric antibodies that had not been discovered in 1984 (the date of the earlier patent application) and, thus, were invalid on written description grounds; given that any such after-arising technology was impermissible new matter as the claims of the later patent had been construed by the district court to cover the after-arising technology.

94. *Id.* at 1339–41.

95. *Id.* at 1341.

96. *Id.* (quoting *In re Hogan*, 559 F.2d 595, 610 (C.C.P.A. 1977) (Miller, J., concurring), and citing *Hogan*, 559 F.2d at 606); *id.* ("We do not need to address all of the insightful comments made by the concurring judge; it is sufficient for the present case that we hold the district court did not err in not applying *Hogan*'s dicta to its enablement analysis.")

97. *Chiron Corp. v. Genetech, Inc.*, 363 F.3d 1247 (Fed. Cir. 2004).

98. *See id.* at 1251–55.

Because the first publication that disclosed chimeric antibody technology did not appear until four months after this filing. . . . [T]his sequence of events shows that this new technology arose after the filing date and thus was, by definition, outside the bounds of the enablement requirement. . . . In the context of the 1984 application, the trial court and this court need not rely on enablement to support the jury's verdict. The jury may have found that the 1984 application does not provide any support for the new matter, chimeric antibodies, claimed in the '561 patent. Because chimeric antibody technology did not even exist at the time of the 1984 filing, the record conclusively supports that the Chiron scientists did not possess and disclose this technology in the February 1984 filing. . . . In this case, the Chiron scientists, by definition, could not have possession of, and disclose, the subject matter of chimeric antibodies that did not even exist at the time of the 1984 application. Thus, *axiomatically*, Chiron cannot satisfy the written description requirement for the new matter appearing in the '561 patent, namely chimeric antibodies.⁹⁹

In *Chiron*, moreover, the Federal Circuit distinguished so-called “nascent” technology (known by the applicant) from after-arising technology, requiring that nascent technology be disclosed by the applicant.¹⁰⁰ And Judge Bryson concurred separately to emphasize that *In re Hogan* should not be understood to have authorized claim meanings to expand for literal infringement so as to cover after-arising technologies, emphasizing that the court had recently “expressed reservations” about such a reading in *Plant Genetic Systems*.¹⁰¹

Nevertheless, in *Superguide v. DirecTV Enterprises*,¹⁰² the Federal Circuit found literal infringement of a claim by after-arising technology

99. *Id.* (citing *Hogan*, 559 F.2d at 605–06) (emphasis added).

100. *See id.* at 1254 (“[A] patent document cannot enable technology that arises after the date of application. The law does not expect an applicant to disclose knowledge invented or developed after the filing date. Such disclosure would be impossible. Nascent technology, however, must be enabled with a ‘specific and useful teaching.’ The law requires an enabling disclosure for nascent technology because a person of ordinary skill in the art has little or no knowledge independent from the patentee’s instruction.”) (citations omitted). Further, such disclosure in theory should include knowledge of the applicant that a nascent technology is in fact an equivalent and thus an embodiment of the claim language. *Cf. Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 609 (1950) (discussing known interchangeability of the allegedly equivalent technology).

101. *See id.* at 1262 (Bryson, J., concurring) (“What must be guarded against, in my view, is to interpret *Hogan* to hold that claims that are enabled by the original application may be construed broadly enough to encompass technology that is not developed until later and was not enabled by the original application. Although there is language in *Hogan* that could be read to support such a result, this court has recently (and properly, in my view) expressed reservations about reading *Hogan* that broadly.”) (citing *Plant Genetic Sys., N.V., v. DeKalb Genetics Corp.*, 315 F.3d 1335, 1340–41 (Fed. Cir. 2003)).

102. *SuperGuide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870 (Fed. Cir. 2004).

without then finding the claim to be invalid. The court rejected the district court's claim constructions, which had excluded after-arising technology (digital television signals) from the construed meaning of the relevant claim language. The district court had treated such claim term meanings (e.g., the claim term "regularly received television signal") as limited to the understanding in the art as of the filing date.¹⁰³ But the Federal Circuit adopted constructions of the claim term meanings that included after-arising technologies. In doing so, the court apparently distinguished functional claim terminology subject to the temporal limitation rule of § 112(f) from structural claim terminology:

*We begin our review of the district court's construction of the asserted claim by agreeing with Gemstar that the court improperly relied on cases involving means-plus-function claims to conclude that later or "after-arising technologies" cannot fall within the literal scope of the claim at issue. Method and apparatus claims not written in means-plus-function format are not necessarily limited to that disclosed in the specification but rather are defined by the language of the claims themselves.*¹⁰⁴

The court rejected the district court's reliance on the understanding of skilled persons that "regularly received" signals as of the filing date could not mean digital signals (when digital televisions were not in common use at that time), but the court distinguished the claims at issue from those in *Kopykake* by stating that the term "regularly received" "did not explicitly limit the disputed claim language to technologies that were 'conventional' at the time of the invention."¹⁰⁵ Further, it appears that the court applied the broadest dictionary meaning approach to construing the

103. *Id.* at 877.

104. *Id.* at 878 (citing *SRI Int'l v. Matsushita Elec. Corp. of Am.*, 775 F.2d 1107, 1121 (Fed. Cir. 1985) (en banc) ("It is the claims that measure the invention.")). *SRI*, however, addressed concerns about not limiting structural claim language to a particular method of operation during prosecution, nor reading the claim language to import all structural limitations in the specification, and that claim meaning is not limited to the best mode disclosed, and went en banc to reject its earlier precedent that the reverse doctrine of equivalents is a question of law, and remanded for factfinding regarding application of that doctrine. *See SRI Int'l*, 775 F.2d at 1118–25. Nevertheless, *SRI* contains dicta when discussing non-restriction of claims to the best mode disclosed that were relied on by *SuperGuide* to permit expansion of claim meaning to after-arising technologies, subject to the reverse doctrine. *See id.* at 1121 ("The law does not require the impossible. Hence, it does not require that an applicant describe in his specification every conceivable and possible future embodiment of his invention. The law recognizes that patent specifications are written for those skilled in the art, and requires only that the inventor describe the 'best mode' known at the time to him of making and using the invention.").

105. *Id.* at 879 (quoting *Kopykake Enters., Inc. v. Lucks Co.*, 264 F.3d 1377, 1380, 1384 (Fed. Cir. 2001)).

claims at issue, an approach articulated in *Texas Digital Systems, Inc. v. Telegenix, Inc.*,¹⁰⁶ but which all of the judges of the en banc *Phillips Corp.* decision later rejected.¹⁰⁷

In *Innogenetics v. Abbott Laboratories*,¹⁰⁸ the Federal Circuit held that a kit using Realtime polymerase chain reaction (PCR) to hybridize samples to probes for hepatitis C virus literally infringed the method claim at issue.¹⁰⁹ The court construed broadly the claim term of detecting “formation of a complex” between the sample and probe, holding that the claim did not require contemporaneous detection of the complex itself (given that the claim included the term “complex *as formed*,” which Abbott argued imposed a temporal limit on detection, and that Abbott’s PCR method destroyed the complex so it only detected the fact that a complex *had been* formed earlier).¹¹⁰ The court relied on *SuperGuide* to state that literal infringement can be found for after-arising technology if “*valid claims . . . are drafted broadly enough.*”¹¹¹ The court held that the claims literally infringed because Abbott had forfeited its district court argument (by raising it at the last minute) that Realtime PCR “was not known to the ordinary artisan at the time of the filing.”¹¹² As noted above, however, if claims are drafted broadly using future-regarding terminology or employ terminology that does not convey a future sense but nevertheless is construed to include after-arising technology, such claims should be held invalid for lack of enablement and of written description.¹¹³ Thus, the statements regarding literal infringement and after-arising technology in *Innogenetics* were unnecessary dicta, both because the argument had been waived and because the supposed later-arising technology was actually known at the time of filing the claims.¹¹⁴

In summary, absent clear Supreme Court or en banc Federal Circuit precedent superseding *Schering, Schering* establishes the current law for

106. *Tex. Dig. Sys., Inc. v. Telegenix, Inc.*, 308 F.3d 1193, 1204 (Fed. Cir. 2002).

107. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1320–21 (Fed. Cir. 2005) (en banc); *id.* at 1328–30 (Lourie, J., concurring); *id.* at 1332 (Mayer, J., dissenting); *SuperGuide Corp.*, 358 F.3d at 874–75 (quoting *Tex. Dig. Sys., Inc.*, 308 F.3d at 1202, and *Teleflex, Inc. v. Ficoso N. Am. Corp.*, 299 F.3d 1313, 1327 (Fed. Cir. 2002)).

108. *Innogenetics, N.V. v. Abbott Labs.*, 512 F.3d 1363 (Fed. Cir. 2008).

109. *See id.* at 1368.

110. *Id.* at 1370–71 (emphasis added).

111. *See id.* at 1371–72 (citing *SuperGuide Corp. v. DirecTV Enters.*, 358 F.3d 870, 878–80 (Fed. Cir. 2004)) (emphasis added).

112. *Id.* at 1371.

113. *See* authorities cited *supra* notes 63–67 and accompanying text.

114. *See Innogenetics, N.V.*, 512 F.3d at 1372 (“Additionally, Abbott itself has put forth evidence that Realtime PCR did in fact exist by the time the inventors filed their PCT application in 1992, and by the time they applied for the ‘704 patent in 1994.”).

literal infringement in regard to after-arising technologies. Of course, the Federal Circuit's rule that the first panel opinion establishes binding circuit precedent may be followed more in the breach than in the observance, as should be evident from *Superguide* and *Innogenetics*. It is also subject to the *Atlantic Thermoplastics* "heresy . . . mutiny. . . illegal[ity]" problem that different panels of judges may interpret Supreme Court precedents differently, treating an earlier panel decision as invalid without taking the issue en banc.¹¹⁵ But the Federal Circuit rarely goes en banc to resolve such differing views of conflicting Supreme Court precedents, and the Federal Circuit did not justify its *Superguide* and *Innogenetics* dicta and holdings on the Supreme Court pioneering invention precedents. As reflected in *In re Hogan* and the cases above, the Supreme Court's pioneering invention patent doctrine cases do not *clearly* supersede the *Schering* holding that prevents after-arising technologies from falling within the scope of claim meaning or application for literal infringement purposes.¹¹⁶ And the Federal Circuit rarely seeks to resolve conflicting panel precedents that result when the earlier-in-time panel decisions are ignored or are only selectively followed.¹¹⁷

In contrast, as discussed in the next Part of this Article, current § 112(f) may be understood to have *required* the holding in *Schering*. If structural claim terms are not construed as limited to technological equivalents *known as of the filing date* to be embodiments, those terms may *effectively* be considered functional claim terms. Temporally unfixed structural claiming language requires functional testing to determine

115. *Atl. Thermoplastics Co. v. Faytex Corp.*, 974 F.2d 1279, 1281 (Fed. Cir. 1992) (en banc) (Rich, J., dissenting from the denial of rehearing en banc) ("The *Atlantic* panel, [which had refused to follow the earlier precedent in the *Scripps Clinic & Research Found. v. Genentech, Inc.*, 927 F.2d 1565 (Fed. Cir. 1991),] continued [to explain that]: 'A[n earlier panel] decision that fails to consider Supreme Court precedent does not control if the court [i.e. the *Atlantic* panel] determines that the prior panel [in the *Scripps* case] would have reached a different conclusion if it had considered controlling precedent.' This is not only insulting to the [prior] *Scripps* panel (Chief Judge Markey, Judge Newman and a visiting judge), it is mutiny. It is heresy. It is illegal.')

116. See authorities cited *supra* notes 21–24 and accompanying text.

117. For example, the en banc Federal Circuit finally resolved the issue in *Atlantic Thermoplastics* only 17 years later, and did so by violating the axiomatic principle that claims are to be construed the same way for infringement as for validity. See *Abbott Labs. v. Sandoz, Inc.*, 566 F.3d 1282, 1291–95 (Fed. Cir. 2009) (relevant portion en banc) (affirming the later-in-time *Atlantic Thermoplastics* panel holding that product-by-process claims may have different meanings for infringement than validity, finally resolving the inconsistency of the two prior panel decisions and the consequent uncertainty of the law during the intervening years, but abrogating the principle that claims are axiomatically to be construed the same way for validity as for infringement); *id.* at 1318 (Newman, J., dissenting) ("For the first time, claims are construed differently for validity and for infringement. It has been an inviolate rule that patent claims are construed the same way for validity and for infringement.") (citations omitted).

whether any after-arising technology should be considered to be equivalent to disclosed structural embodiments. Such temporally unfixed structural terms therefore should also be subject to the § 112(f) rule of claim construction for functional claiming language, as it has been interpreted by the Federal Circuit in *Chiuminatta Concrete Concepts, Inc. v. Cardinal Industries, Inc.*¹¹⁸ and *Al-Site Corp. v. VSI International, Inc.*¹¹⁹ That interpretation temporally fixes literal infringement meaning and application scope, restricting it to technologies equivalent to those disclosed in the specification and (at least constructively) known to be equivalent (and thus to be claim embodiments) at the time of filing.¹²⁰

IV. FUNCTIONAL CLAIM TERMS DO NOT EXTEND TO AFTER-ARISING TECHNOLOGIES, AND STRUCTURAL CLAIM TERMS NOT TEMPORALLY LIMITED TO KNOWN EQUIVALENT EMBODIMENTS SHOULD BE TREATED AS FUNCTIONAL.

Prior to the 1952 Act, the Supreme Court expressed substantial ambivalence about its earlier approaches to permissible claim scope, particularly in regard to functionally claimed inventions. In the 1946 *Halliburton Oil Well Cementing v. Walker* case,¹²¹ the Supreme Court precluded the use of functional claiming language for literal infringement purposes that would treat any after-arising equivalent technologies as construed claim embodiments, at least at the point of novelty of the claim:

We must, however, determine whether, as petitioner charges, the claims here held valid run afoul of Rev. Stat. § 4888 because they do not describe the invention but use “conveniently functional language *at the exact point of novelty.*” . . . The language of the claim thus describes this most crucial element in the ‘new’ combination in terms of what it will do rather than in terms of its own physical characteristics or its arrangement in the new combination apparatus. We have held that a claim with such a description of a product is invalid as a violation of Rev. Stat. § 4888. . . . It is urged that our conclusion is in conflict with the decision of *Continental Paper Bag Co.* . . . In that case, however, the claims structurally described the physical and operating relationship of all the crucial parts of the novel combination.¹²²

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

119. *Al-Site Corp. v. VSI Int’l, Inc.*, 174 F.3d 1308 (Fed. Cir. 1999).

120. *See Chiuminatta Concrete Concepts*, 145 F.3d at 1310; *Al-Site Corp.*, 174 F.3d at 1320.

121. *Halliburton Oil Well Cementing Co. v. Walker*, 329 U.S. 1 (1946).

122. *See id.* at 8–9, 14 (emphasis added) (citing *Cont’l Paper Bag Co. v. E. Paper Bag Co.*, 210 U.S. 405 (1908), and *Holland Furniture Co. v. Perkins Glue Co.*, 277 U.S. 245 (1928)).

In response, Congress revised the *Halliburton* holding to impose a particular rule of construction for claims using functional claiming language. Then § 112, ¶ 3 (later ¶ 6, and now § 112(f)) provides:

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.¹²³

The Supreme Court has not weighed in on this provision, except (as noted above) to hold in *Warner-Jenkinson Co. v. Hilton Davis Chemical Co.*¹²⁴ that it did not impliedly repeal the Court's doctrine of equivalents decision in 1950 in *Graver Tank & Manufacturing Co. v. Linde Air Products Co.*¹²⁵ *Graver Tank* had authorized patent protection beyond the construed scope of meaning and application of patent claims.¹²⁶

In contrast, the Federal Circuit has construed § 112(f) to impose a temporal restriction on the meaning and application of functional claim terms, restricting them from after-arising technologies. This rule of claim interpretation restricts claim meaning and application scope to those *structural* technologies embodying the *identically* claimed function that were *known at the time of filing* to perform the function and to be equivalent to structural embodiments of that function disclosed in the specification. As the Federal Circuit stated in *Chiuminatta Concrete Concepts, Inc. v. Cardinal Industries, Inc.*:¹²⁷

The doctrine of equivalents is necessary because one cannot predict the future. Due to technological advances, a variant of an invention may be developed after the patent is granted, and that variant may constitute so insubstantial a change from what is claimed in the patent that it should be held to be an infringement. Such a variant, based on after-developed technology, *could not have been disclosed in the patent*. Even if such an element is found not to be a § 112, ¶ 6, equivalent because it is not equivalent to the structure disclosed in the patent, this analysis should not foreclose it from being an equivalent under the doctrine of equivalents.¹²⁸

123. 35 U.S.C. § 112(f) (2018).

124. *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 27–28 (1997).

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

126. *See Warner-Jenkinson Co.*, 520 U.S. at 27–28; *Graver Tank & Mfg. Co.*, 339 U.S. at 608–09; *see* authorities cited *supra* notes 19–21 and accompanying text.

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

128. *Id.* at 1310 (emphasis added).

One year later, the Federal Circuit elaborated on its holding in *Chiuminatta Concrete Concepts* to make this implication even clearer in *Al-Site Corp. v. VSI International, Inc.*:¹²⁹

As this court has recently clarified, a structural equivalent under § 112 must have been available at the time of the issuance of the claim. An equivalent structure or act under § 112 cannot embrace technology developed after the issuance of the patent because *the literal meaning of a claim is fixed upon its issuance*. An “after arising equivalent” infringes, if at all, under the doctrine of equivalents.¹³⁰

And as the court has more recently explained:

In *Chiuminatta*, we explained that there are two differences between the equivalence determination made for literal infringement purposes under § 112(f) and a doctrine of equivalents determination for the same limitation: timing and [identity rather than just similarity of] function.¹³¹ Equivalence under section 112(f) is evaluated at the time of issuance. Equivalence under the doctrine of equivalents, in contrast, is evaluated at the time of infringement. Hence, an *after-arising technology*, a technology that did not exist at the time of patenting, can be found to be an equivalent under the doctrine of equivalents *even though it cannot be an equivalent under the literal infringement analysis of § 112(f)*.¹³²

Thus, whenever such functional claiming language is construed to be present (under the en banc Federal Circuit’s new standards¹³³ for determining whether claim language is subject to the § 112(f) interpretive rule), the functional claim terms *cannot* be literally infringed by any after-arising technologies. This is true even if the after-arising technology performs the identical function and is structurally equivalent to disclosed embodiments in the specification, so long as the identity of function or the structural equivalency was not known (at least constructively to a person of ordinary skill in the art) at the time of filing. Similarly, such functional claim terms also should not apply to any nascent technologies existing as of the filing date but that were not known in the art to perform the function

129. *Al-Site Corp. v. VSI Int’l, Inc.*, 174 F.3d 1308 (Fed. Cir. 1999).

130. *Id.* at 1320 (emphasis added) (citation omitted).

131. *See Chiuminatta Concrete*, 145 F.3d at 1310; *Odetics, Inc. v. Storage Tech. Corp.*, 185 F.3d 1259, 1267 (Fed. Cir. 1999).

132. *Ring & Pinion Serv. Inc. v. ARB Corp.*, 743 F.3d 831, 839 (Fed. Cir. 2014) (citing *Chiuminatta Concrete*, 145 F.3d at 1310, and *Al-Site*, 174 F.3d at 1320) (emphasis added).

133. *See, e.g., Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1349 (Fed. Cir. 2015) (relevant portion en banc) (rejecting various earlier panel decisions that had created a “strong” presumption *against* the application of § 112(f) when the claim limitation at issue did not employ the specific terms “means for” or “step for” but nevertheless should be construed as functional claiming language that triggers the statutory construction rule).

and to be equivalent structures. To so hold would render such claims invalid for lack of written description under the *Ariad Pharmaceuticals* possession test as the specification would not objectively disclose that the inventor “visualized or recognized” that its functional claim terms embraced structures unknown-to-be equivalent or unknown to perform the required functions.¹³⁴

Thus, for literal infringement purposes, functional claiming language must be restricted (under the Federal Circuit’s interpretation of § 112(f)) to structures known to perform the recited function and known to be equivalent at the time of filing. This is all the more true for after-arising technologies that require *later-developed testing methods* in order for a skilled practitioner to recognize or to demonstrate that the after-arising technologies perform the same function and are structurally equivalent.¹³⁵ The § 112(f) temporal fixation rule must apply, unless the axiomatic equivalency of claim meaning for validity and claim meaning for literal infringement is to be violated.

But what about *structural* claim terms that Congress (and the Federal Circuit by construction) has *not* statutorily subjected to § 112(f)’s temporal fixation rule? I believe that such structural language *also* should subject to the same temporal fixation rule, applying only to structures that were known in the art at the time of filing to be equivalent structures within the meaning of the structural claim language.

The reason for restricting such structural claiming language to *known-to-be* equivalent structures is based on treating the claim terms (as concepts) to be “intensional” definitions that specify the necessary and sufficient conditions for their meaning and thus for their factual

134. *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1350–51 (Fed. Cir. 2010) (en banc). See *supra* note 100 and accompanying text (discussing the need to explicitly disclose in the specification any nascent technology).

135. Cf. Cotropia, *supra* note 61, at 153 (“Inventors can write claim language to include technologies unknown at the time of drafting by using functional or generally descriptive terms so as not to ‘date’ the claim terms.”); Timothy C. Saulsbury, *Pioneers Versus Improvers: Enabling Optimal Patent Claim Scope*, 16 MICH. TELECOMM. & TECH. L. REV. 439, 456 (2010) (“When improvements are framed in terms of newly-invented (or newly discovered) properties for preexisting things, it becomes clear that thing construction can conceal the post-filing growth in literal scope that is required for a claim to encompass later-developed technology; a court need only engage in a manner of thing construction that overlooks the newly-invented property that marks the improvement as later developed.”); *id.* at 456 n.99 (“This elimination ‘renders the after-arising property irrelevant to the identity of thing-types and the distinctions between them. When the after-arising property is not a definitional property of the tallied thing-types, the allegedly infringing [improvement] can be thrown into a preexisting conceptual thing-type basket created for the constructively disclosed [i.e., enabled,] embodiments.’”) (quoting Collins, *supra* note 3, at 518).

application.¹³⁶ If claim scope were not temporally fixed in this manner, it would require functional testing to determine whether structures that are not *already* known to be within the necessary and sufficient conditions of the meaning of structural claim terms exhibit those conditions of meaning. This would effectively convert the structural claim term into a functional claim term. Conversely, where functional testing demonstrates that the necessary and sufficient functional conditions of structural meaning are lacking, the alleged structural equivalent should be excluded from the claim meaning under the so-called reverse doctrine of equivalents.¹³⁷

As Professor Chisum noted in his treatise, “[i]t would seem to follow that, to the extent that the meaning of a patent claim depends on the state of the art or on tests, standards or measurements established in the art, the time framework should be the filing date.”¹³⁸ And if functional testing is required to determine whether technologies not already recognized as structural term embodiments should be treated as exhibiting the necessary and sufficient conditions of structural meaning, then the structural claim term is effectively operating as a functional limitation¹³⁹ and should *also* be subject to the § 112(f) temporal fixation rule.¹⁴⁰

136. See generally Roy T. Cook, *Intensional Definition*, in A DICTIONARY OF PHILOSOPHICAL LOGIC 155 (2009). In contrast, one might treat claim meaning as *extensional*, requiring analogical similarity judgments to determine meaning rather than using logical deduction to determine the application (or not) of necessary and sufficient conditions of *intensional* meaning to particular sets of facts. Cf., e.g., Terje Aaberge & Rajendra Akerkar, *Ontology and Ontology Construction: Background and Practices*, 9 INT’L J. COMPUTER SCI. & APPLICATIONS 32, 32 (2012) (“There are two ways of representing meaning formally, referred to as *extensional* and *intensional* and corresponding to the complementary theories of meaning, semantics and pragmatics; semantics focuses on the relation between words and what they stand for, their denotata, while pragmatics concern how context contributes to meaning.”).

137. See, e.g., *Boyden Power-Brake Co. v. Westinghouse*, 170 U.S. 537, 569, 571 (1898) (“But, after all, even if the patent for a machine be a pioneer, the alleged infringer must have done something more than reach the same result. He must have reached it by substantially the same or similar means, or the rule that the function of a machine cannot be patented is of no practical value. To say that the patentee of a pioneer invention for a new mechanism is entitled to every mechanical device which produces the same result is to hold, in other language, that he is entitled to patent his function. Mere variations of form may be disregarded, but the substance of the invention must be there. . . . Conceding that the functions of the two devices are practically the same, the means used in accomplishing this function are so different that we find it impossible to say, even in favor of a primary patent, that they are mechanical equivalents.”).

138. CHISUM ON PATENTS, *supra* note 35, at § 18.03(2)(g).

139. See *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1349–51 (Fed. Cir. 2015); see authorities cited *supra* notes 29–30 and accompanying text.

140. Similarly, even if structural claim meaning is treated as an *extensional* definition, requiring similarity comparisons to disclosed embodiments to determine equivalency and to build up the set of embodiments of meaning, determining such similarity and including it within the scope of that extensional meaning will still require functional testing. Cf. Jeffrey A. Lefstin, *The Formal Structure of Patent Law and the Limits of Enablement*, 23 BERKELEY TECH. L.J. 1141, 1205–06 (2008)

Further, the knowledge acquired in the process of such functional testing to determine the application of structural meaning may lead to further refinement of the meaning of the structural claim language.¹⁴¹ In doing so, it may make clearer the *functional* requirements that were intended by the earlier structural meaning.¹⁴² Thus, failing to fix temporal meaning or temporal application of meaning to structures that were known at the time of filing to be equivalent substitutes to embodiments of structural claim terms *effectively converts* structural claiming terms into functional claiming terms.¹⁴³

In many cases, it may be extremely difficult to determine the implicit functions of structural claim terms in order to determine what things in the world exhibit the necessary and sufficient conditions of structural meaning (as of the effective filing date). For example, it may be unclear what functions must be performed for some new combination of structures to constitute a claimed door “knob.”¹⁴⁴ And it may require later

(discussing the written description “possession” test and noting that “[r]ecitation of the features or properties of a genus corresponds to definition by intension, or definition per genus et differentiam. In this classical mode of definition, a thing is defined by specifying the proximate genus to which it belongs, and those properties which differentiate it from other members of the genus. The alternative mode of description suggested by *Lilly*, enumeration of a representative number of members of the genus, corresponds to definition by extension, or definition by type. It proceeds by designating some individual or group of individuals as central or typical members of the genus and determining membership in the genus by degree of resemblance. Yet every claim is in the end a genus claim.”); Lemley, *supra* note 53, at 120 n.81 (“The effective scope of those claims may still expand over time for another reason. . . . [A]s new species within the genus are discovered, the practical scope of the patent is broadened to cover new products. But the legal scope of the claimed invention remains the same.”).

141. See Lefstin, *supra* note 140, at 1205–06. It may also alter claim meanings, typically by expansion and also by potentially suggesting more precise, intentional definitions of the meanings for the claimed structural terms. See, e.g., *Schering Corp. v. Amgen Inc.*, 222 F.3d 1347, 1352 (Fed. Cir. 2000); see authorities cited *supra* notes 79–80 and accompanying text.

142. Thus, in *Schering*, the court held that further analysis and testing that led to expansion of structural term meaning had to be limited to the earlier understanding, or it would have imported new matter. See *Schering*, 222 F.3d at 1352.

143. Cf. *Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus., Inc.*, 145 F.3d 1303, 1310 (Fed. Cir. 1998) (“stating in reference to the doctrine of equivalents that consideration ‘must be given to the purpose for which an ingredient is used in a patent, the qualities it has when combined with the other ingredients, and the function which it is intended to perform. An important factor is whether persons reasonably skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was.’”) (quoting *Graver Tank & Mfg. Co. v. Linde Air Prod. Co.*, 339 U.S. 605, 609 (1950)) (emphasis added).

144. See, e.g., *Hotchkiss v. Greenwood*, 52 U.S. (11 How.) 248, 264 (1850) (“The improvement consists in making the knobs of clay or porcelain, and in fitting them *for their application to doors, locks, and furniture, and various other uses to which they may be adapted*”) (emphasis added). Cf. Lefstin, *supra* note 140, at 1199 (“The question of ‘possession of the invention’ is simply not a meaningful inquiry under our current claiming system. In the peripheral claiming system, ‘the

developments in the state of the art to actually determine what those functions were that established the conditions of meaning of the structural terms as they were understood as of the filing date (which may then lead to further specifying the necessary and sufficient conditions of structural term meanings).¹⁴⁵ Thus, unless structural claim term meaning and application scope is fixed by reference to technologies at least *constructively* known by a skilled artisan as of the filing date to exhibit those functions and to be embodiments, the claim term should be considered a functional claim term subject to § 112(f), just as if it employed more explicitly functional claiming language.¹⁴⁶ Consequently, under current law (as § 112(f) has been construed), *all* claim terms should have temporally fixed construed meanings *and* temporally fixed applications of those meanings for purposes of both validity and infringement determinations. At least until the interpretation of § 112(f)

invention' is a *bundle of properties* recited by the claims, defining the perimeter of the patentee's legal right to exclude.") (emphasis added).

145. See, e.g., *cf.* *Genentech, Inc. v. Wellcome Found. Ltd.*, 29 F.3d 1555, 1567–68 (Fed. Cir. 1994) ("The operative definition for purposes of equivalency analysis is the intended function as seen in the context of the patent, the prosecution history, and the prior art. Based on our review of these materials, we conclude that no *reasonable* jury could have adopted the broad definition suggested by the trial court. As noted, the specification expressly defines fibrin binding as a critical component of the 'function' of human t-PA. . . . Other evidence confirms this. According to a British patent application filed by Foundation, it is critical in a therapeutic sense—it reduces the risk of hemorrhaging. Moreover, as Drs. Goeddel and Collen testified, the fibrin binding affinity of human t-PA is a critical distinction between this protein and the two prior plasminogen activators, urokinase and streptokinase. Thus, a functional definition of t-PA which ignores this distinction would result in a range of equivalents which impermiss[i]bly reads on the prior art.") (citing *Graver Tank*, 339 U.S. at 609; *Zenith Labs., Inc. v. Bristol-Myers Squibb Co.*, 19 F.3d 1418, 1425 (Fed. Cir. 1994)) (emphasis added).

146. *Cf.* *Halliburton Oil Well Cementing Co. v. Walker*, 329 U.S. 1, 11–12 (1946) ("Neither in the specification, the drawing, nor in the claims here under consideration, was there any indication that the patentee contemplated any specific structural alternative for the acoustical resonator or for the resonator's relationship to the other parts of the machine. . . . Just how many different devices there are of various kinds and characters which would serve to emphasize these echoes, we do not know. The Halliburton device, alleged to infringe, employs an electric filter for this purpose. 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. . . . Yet if Walker's blanket claims be valid, no device to clarify echo waves, now known or hereafter invented, whether the device be an actual equivalent of Walker's ingredient or not, could be used in a combination such as this, during the life of Walker's patent."); Mark A. Lemley, *Software Patents and the Return of Functional Claiming*, 2013 WIS. L. REV. 905, 905–06 (2013) ("Most software patents today are written in functional terms. If courts would faithfully apply the 1952 Act, limiting those claims to the actual algorithms the patentees disclosed and their equivalents, they could prevent overclaiming by software patentees and solve much of the patent thicket problem that besets software innovation.").

is further changed by Congress,¹⁴⁷ the Supreme Court, or the Federal Circuit en banc.

Congress was careful in 1952 to preserve much of the prior law regarding claim scope when it adopted the predecessor to § 112(f). Although Congress expressly rejected proposed legislative language that would have explicitly *authorized* functional claiming language to apply to after-arising technologies, Congress did not thereby *clearly prohibit* such a judicial interpretation.¹⁴⁸ As discussed above, the Supreme Court has not interpreted § 112(f) except peripherally in regard to not overruling the doctrine of equivalents, and the Federal Circuit has not to date construed § 112(f) to permit the functional claiming of after-arising technologies.¹⁴⁹ For the additional reasons expressed above, structural claiming language should be treated the same way.

Nevertheless, change remains possible. Congress or the courts could permit literal infringement scope to expand to technologies not known to be equivalent embodiments of functional or structural claiming terms as of the filing date. But if such changes were to be made, they will raise many more, and more complex issues in addition to breaking the axiomatic symmetry of claim scope for validity and literal infringement

147. *Cf., e.g.*, Press Release, Senator Thom Tillis, Sens. Tillis and Coons and Reps. Collins, Johnson, and Stivers Release Draft Bill Text to Reform Section 101 of the Patent Act (May 22, 2019) (available at <https://www.tillis.senate.gov/2019/5/sens-tillis-and-coons-and-reps-collins-johnson-and-stivers-release-draft-bill-text-to-reform-section-101-of-the-patent-act> [https://perma.cc/53BM-DDGK]) (Draft 101 Legislative Language circulated by Senators Tillis and Coons for U.S. Senate Judiciary Committee, Subcommittee on Intellectual Property Hearings, June 4, 2019. Draft language apparently intended to codify the holding in *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1349–51 (Fed. Cir. 2015): “Section 112 (f) Functional Claim Elements— An element in a claim expressed as a specified function without the recital of structure, material, or acts in support thereof shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.”).

148. *See* Sarnoff, *DOE Part II*, *supra* note 20, at 490–91 (“A coordinating committee of patent law associations had suggested specific changes to a draft of what was then H.R. 3760, which included a recommendation to add to the mean-plus-function claim provision language authorizing such claims to encompass equivalents ‘whether or not known at the time the invention was made.’ The legislative history is silent as to why Congress did not adopt the recommendation. Given the consistent prior case law limiting improvement inventions to known technological equivalents, Congress most likely would have adopted such language if it had meant to encourage the courts to provide protection for later-arising equivalents of such functionally drafted claims.”) (citation omitted). *Cf. id.* at 473 (A long line of cases under the 1870 Act imposed “limits on claim scope and claiming language [that] prevented improvement invention patents from treating as equivalents to claimed embodiments all later-arising, patentable or unpatentable substituted technologies. These limits also prevented pioneering invention patents from claiming or having their claims apply to later-arising, substituted technologies that the inventor had not invented, disclosed, or enabled.”).

149. *See* authorities cited *supra* notes 27–30, 127–133 and accompanying text.

purposes.¹⁵⁰ Temporally expanding literal claim scope will duplicate the function of the doctrine of equivalents in protecting after-arising technologies, and thereby further complicate claim construction.¹⁵¹ It will also require determining whether such temporally expanding claim scope not conceived by the inventor constitutes patent eligible subject matter¹⁵² or otherwise is permissibly claimed.¹⁵³

V. CONCLUSION

Recognizing that current law does not permit structural claim term scope for literal infringement to encompass after-arising technologies will have substantial implications. In contrast, current law interpreting § 112(f) treats functional claim term scope as limited to equivalents known as of the filing date.

As I stated many years ago, echoing the concerns noted by Judge Miller in his concurring opinion in *In re Hogan*¹⁵⁴:

[t]he 1952 Patent Act . . . should be interpreted to have authorized, but not to have required, application of functional claims for improvement

150. See authority cited *supra* note 12 and accompanying text. Cf. Stephens, *supra* note 14, at 5 (“[A]s Kitchin LJ put it in *Smith & Nephew v. Convatec*, [[2015] EWCA Civ 607] ‘the scope of any . . . claim must be exactly the same whether one is considering infringement or validity.’”).

151. Cf. Stephens, *supra* note 14, at 4–5 (discussing two recent U.K. cases applying the new *Actavis* standard that found the accused technologies to fall within a purposive construction, but if they had not done so then they should not be considered equivalents even though they achieved the same function).

152. See, e.g., *O’Reilly v. Morse*, 56 U.S. 62, 117 (15 How. 1853) (“Professor Morse has not discovered, that the electric or galvanic current will always print at a distance, no matter what may be the form of the machinery or mechanical contrivances through which it passes.”); *Risdon Iron & Locomotive Works v. Medart*, 158 U.S. 68, 71–72 (1895) (“That certain processes of manufacture are patentable is as clear as that certain others are not, but nowhere is the distinction between them accurately defined. There is somewhat of the same obscurity in the line of demarkation . . . between a new article of manufacture, which is universally held to be patentable, and the function of a machine, which it is equally clear is not. It may be said in general that processes of manufacture which involve chemical or other similar elemental action are patentable, though mechanism may be necessary in the application or carrying out of such process, while those which consist solely in the operation of a machine are not. . . . But, if the operation of his device be purely mechanical, no such considerations apply, since the function of the machine is entirely independent of any chemical or other similar action.”).

153. See, e.g., *Holland Furniture Co. v. Perkins Glue Co.*, 277 U.S. 245, 256–58 (1928) (“But an inventor may not describe a particular starch glue which will perform the function of animal glue and then claim all starch glues which have those functions, or even all starch glues made with three parts of water and alkali, since starch glues may be made with three parts of water and alkali that do not have those properties. . . . [T]he attempt to broaden product claims by describing the product exclusively in terms of its use or function is subject to the same vice as is the attempt to describe a patentable device or machine in terms of its function. As a description of the invention, it is insufficient, and, if allowed, would extend the monopoly beyond the invention.”) (emphasis added).

154. See authorities cited *supra* note 22.

inventions to later-arising equivalent technologies. Nothing in the language adopted by Congress reflects an intent to freeze judicial interpretation regarding the permissible scope of future embodiments that can be claimed using such functional language. To the extent that the courts decide to apply functional claims for improvement inventions to later-arising substituted technologies, however, they will have to contend with two hundred years of patent claim scope doctrines and with the Constitutional mandate to promote progress.¹⁵⁵

It also should be apparent that changing the law of literal infringement to *explicitly* permit structural and functional claim terms to encompass after-arising technologies would have dramatic consequences. It should be authorized only with the greatest of care and subjected to articulated limits.¹⁵⁶ And it should be done only after substantial further analysis of the likely consequences and further evaluations of the continued validity and scope of the pioneering invention patent doctrine and its relationship to eligible subject matter, claim construction, and the doctrine of equivalents principles.¹⁵⁷

155. Sarnoff, *DOE Part II*, *supra* note 20, at 491.

156. Cf. Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 843, 848 (1990) (“[C]ontrary to what Kitch suggests, we do not *presume* that granting broad scope to an initial inventor induces more effective development and future invention. We regard this as an open question Theoretical argument alone, however, cannot resolve the question of whether technical advance proceeds more vigorously and effectively under competition or under a regime where one person or organization has a considerable amount of control over developments It is difficult to resolve issues like these when a patent is filed; at that point, no one knows what future developments will follow or how difficult it will be to achieve them. Thus, there is an argument for granting a broad set of claims for pioneering inventions. . . . But surely one can go too far.”).

157. Cf. 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, 2003–04 (2005) (“Despite a solid theoretical basis for giving pioneers generous protection against literal infringement, it is not immediately clear that the high social value of pioneer inventions justifies special treatment under the DOE. If not for frictions, pioneers could get appropriately broad scope by relying on the claim language in their patents. In the absence of frictions that constrain claim scope, more generous treatment of pioneers under the DOE would over-reward pioneers and possibly stifle cumulative innovation. . . . Not surprisingly, we suggest that refinement costs, rather than frictions, may be larger for pioneers. In particular, we conjecture that many pioneer inventors face a tougher problem of visualizing and enumerating the many possible methods of imitating a pioneer invention.”).