



5-5-2022

Bright Stars or Unreliable Compasses: Navigating Patent Definiteness During the Fourth Industrial Revolution

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Recommended Citation

N. Thane Bauz, *Bright Stars or Unreliable Compasses: Navigating Patent Definiteness During the Fourth Industrial Revolution*, 8 Tex. A&M J. Prop. L. 365 (2022).

Available at: <https://doi.org/10.37419/JPL.V8.I4.1>

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**BRIGHT STARS OR UNRELIABLE COMPASSES: NAVIGATING PATENT
DEFINITENESS DURING THE FOURTH INDUSTRIAL REVOLUTION**

N. Thane Bauz[†]

Abstract

This Article traces the evolution of the definiteness requirement over the course of two centuries. From the time of inventions relating to flour mills, the definiteness requirement evolved into the consequence for drafting uninterpretable claims. Without considering the reasons for this evolution, the Supreme Court in its Nautilus decision returned the standard for assessing definiteness to its root form. Given the consequences are the loss of patent rights, this Article grapples with the Supreme Court's decision during an era where complex and convergent technologies are more commonplace. The Article also analyzes empirical evidence six years before and six years after the Nautilus decision to forecast its impact as we head deeper into the Fourth Industrial Revolution.

DOI: <https://doi.org/10.37419/JPL.V8.I4.1>

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I. INTRODUCTION

In the 1870s, inventors were finding new ways to improve steam-powered engines for locomotives.¹ In 2021, inventors are working to

1. In 1876, Anatole Mallet, a French engineer, introduced a method of using two steam powered cylinders (“compound locomotive”) for railway locomotives. The design significantly increased power and adhesion. See DANIEL KINNEAR CLARK, THE STEAM ENGINE: A TREATISE ON STEAM ENGINES AND BOILERS 603 (1891) (citing M.A. Mallet, *On the Compounding of Locomotive Engines*, in PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS 328 (1879)).

further the emerging space travel market.² Not surprisingly, the speed and complexity of innovation in what has been deemed the Fourth Industrial Revolution (“4IR”)³ is unparalleled. However, what is surprising is the fact that the definiteness requirement has remained largely unchanged since 1870.⁴

Circa 1870, judges were seemingly undaunted by the challenges associated with assessing patented technology. In one case concerning enablement, the Supreme Court confidently announced that with the evidentiary record in hand, including the testimony of those skilled in the art, it had no difficulty grasping the patented invention.⁵ Years later, the Court opined that disclosing the “dominate idea” of the invention suffices for purposes of definiteness.⁶ During World War I, the Court added that “the certainty which the law requires in [the patent claims] is not greater than is reasonable, having regard to their subject-matter.”⁷ At issue was a process of recovering “ores” from gangue⁸ by introducing “oily liquid” and “agitating” the “mixture.”⁹ During World War II, the Court addressed claims directed to “pure carbon black” used in manufacturing rubber.¹⁰ The Court held that in order to satisfy the definiteness requirement, claims must be “reasonably clear-cut” to help the court determine whether “novelty and

2. Micah Maidenberg & Doug Cameron, *Blue Origin Launch: Jeff Bezos and Crew Complete Successful Space Flight*, WALL ST. J. (July 20, 2021), <https://www.wsj.com/articles/jeff-bezos-blue-origin-crew-set-for-space-debut-11626775480?page=1> [perma.cc/RFS7-KVMD].

3. The term Fourth Industrial Revolution has been attributed to Klaus Schwab, founder of the World Economic Forum. See KLAUS SCHWAB, *THE FOURTH INDUSTRIAL REVOLUTION* (2015).

4. *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 902 (2014). While the Nautilus Court was referencing the fact that the statutory provision has remained unchanged, as discussed in this paper, the legal framework stemming from that provision has also remained largely unchanged.

5. *Webster Loom Co. v. Higgins*, 105 U.S. 580, 586 (1881) (The patent was directed to improvements in a loom for weaving fabric.).

6. *Carnegie Steel Co. v. Cambria Iron Co.*, 185 U.S. 403, 437 (1902) (applying the observations of Justice Bradley in *Webster Loom*).

7. *Mins. Separation, Ltd. v. Hyde*, 242 U.S. 261, 270 (1916).

8. Gangue is the commercially valueless mineral matter occurring with the desired ore in a vein or deposit. *Gangue*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/gangue> [https://perma.cc/F4GV-93ML].

9. *Mins. Separation*, 242 U.S. at 263 (“the claimed discovery of the patent-in-suit relates ‘to improvements in the concentration of ores, the object being to separate metalliferous matter, graphite, and the like from gangue by means of oils, fatty acids, or other substances which have a preferential affinity for metalliferous matter over gangue.’”).

10. *United Carbon Co. v. Binney & Smith Co.*, 317 U.S. 228, 232 (1942).

invention are genuine” and avoid a “zone of [proprietary] uncertainty” that would undermine “enterprise and experimentation.”¹¹

Five decades later, the 4IR technological landscape is teeming with complex, rapidly evolving, and interdependent technologies. Information and communications technology (“ICT”) as well as the Internet of Things (“IoT”) drive the 4IR technological landscape. Against this backdrop, the standard for indefiniteness gradually became more difficult to uniformly apply. For this reason, the Federal Circuit in 2002 significantly modified the standard. However, in 2014, the Supreme Court changed the standard for definiteness back to what it was 72 years earlier.¹² On remand, the Federal Circuit remarked that “we may now steer by a ‘bright star’ rather than an ‘unreliable compass.’”¹³ The historical evolution of definiteness as well as the technology and market conditions in the 4IR demonstrate that the difference is not trivial.

II. THE DEFINITENESS REQUIREMENT

A. *Definiteness in the Nineteenth Century*

The Patent Act of 1790, the very first patent act in the United States, planted the seed for the definiteness requirement the 1790 Patent Act required patentees to file a written specification “containing a description . . . of the thing or things . . . invented or discovered,” which “shall be so particular” as to “distinguish the invention or discovery from other things before known and used.”¹⁴ The definiteness seed soon germinated into the Patent Act of 1793.¹⁵ That Act included a provision that an inventor “shall deliver a written description of [the] invention . . . in *full, clear and exact terms*, as to distinguish the same from all other things before known”¹⁶ In the years that followed, patent practitioners added separate sentences in the specification, referred to as “claims,” to identify the invention.¹⁷ However, this practice was often form over substance. By way of example, the Supreme Court reviewed the following claim: “I claim the above-described new

11. *Id.* at 236–37.

12. *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 911 (2014).

13. *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374, 1379 (Fed. Cir. 2015).

14. Patent Act of 1790, § 2, 1 Stat. 110 (1790).

15. Patent Act of 1793, § 3, 1 Stat. 318–23 (1793).

16. *Id.*

17. See generally R. MOY, WALKER ON PATENTS § 4.2, 4-17 to 4-20 (4th ed. 2012).

manufacturer of deodorized heavy hydrocarbon oils . . . by treating them substantially as herein before described.”¹⁸ It was not uncommon for a number of known elements to be recited only to be followed by a catch-all reference to the specification.¹⁹ Without established rules concerning definiteness, claim drafting, or claim construction, adjudicating the scope of the invention was disparate and subjective.

In 1822, in *Eaton v. Evans*,²⁰ the Supreme Court grappled with the issue of claim coverage over an improvement to an apparatus. The claim at issue recited in part “the peculiar properties or principles which the machine possesses”²¹ In evaluating the scope of the claimed invention, the Court required that patentees “explain what is the nature or *limit* of the improvement . . . claim[ed].”²² The Court reasoned that doing so will “guard against prejudice or injury from the use of an invention which [an accused infringer] may otherwise innocently support not to be patented.”²³ Congress codified *Evans* in the years that followed. In the Patent Act of 1836, Congress for the first time required inventors to set out their inventions with “particularity.”²⁴ However, at this time claims were still optional.²⁵ In the Patent Act of 1870, Congress expressly required that patent claims have particularity and distinctiveness.²⁶

The definiteness requirement from the Patent Act of 1870 remains “largely unaltered.”²⁷ Yet, the early Supreme Court decisions yield the

18. *Merrill v. Yeomans*, 94 U.S. 568, 570 (1876) (evaluated the definiteness of this claim).

19. *See, e.g.*, *Brooks v. Fiske*, 56 U.S. 212, 215 (1853) (claim 1 of U.S. Pat. No. 5315x recites “the employment of rotary planes substantially such as herein described, in combination with rollers or any analogous device to prevent the board from being drawn up by the planes when cutting upward or from the reduced or planed to the unplanned surface, as described”); *McClain v. Ortmayer*, 141 U.S. 419 (1891) (“in the manner shown or described, and for or with the purposes set forth.”).

20. 20 U.S. 356, 357 (1822).

21. *Id.* at 398.

22. *Id.* at 434 (emphasis added).

23. *Id.*

24. Patent Act of 1836, ch. 357, § 6, 5 Stat. 117 (1836).

25. *See* Joseph Mueller, *Claims as Pointers: The Statutory Approach to Claim Construction*, 12 J. INTELL. PROP. 501, 504 (2005); *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 378–79 (1996); RISDALE ELLIS, PATENT CLAIMS, §§ 3–4 (1949).

26. Patent Act of 1870, ch. 230, § 26, 16 Stat. 198–217 (1870) (requiring inventors to “particularly point out and distinctly claim the improvement, or combination which [the inventor] claims as [their] invention or discovery”).

27. *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 902 (2014) The Patent Act of 1952 modified the phraseology to convey the same requirement: patent applicants were required to sum up the specification with “one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant

conclusion that the definiteness requirement was merely a rationale in want of a legal framework. As noted above, claims were not required until the Patent Act of 1870. Hence, given the infancy of claim drafting fundamentals, to the extent claims were even included in the disclosure, uniformity was impracticable. However, it was also apparent that the Court was attempting to regulate the scope of the patent grant but without guideposts. In 1871, the Court in *Seymour v. Osborne* set forth four abstract categories of invention.²⁸ The Court then enumerated corresponding rules regarding definiteness relative to those categories.²⁹ The category and rules did not offer much. Without analysis of the claims-in-suit, the Court proclaimed that “it is clear that the [definiteness] objection cannot prevail in respect to any one of the several letters patent on which the suit is founded.”³⁰ These early cases exposed the challenges of uniformly applying the definiteness requirement.

B. Definiteness in the Twentieth Century

Minerals Separation v. Hyde is an early twentieth-century case that provided high-level guidance on the definiteness requirement.³¹ There, the patent-in-suit discloses a process that efficiently and economically separates ore from gangue.³² The point of novelty is agitating a mixture of pulverized ore in water and then introducing air bubbles by agitating.³³ Unlike the prior art, much less oil can be added if

regards as [their] invention.” 35 U.S.C. § 112, ¶2 (2006). The Leahy-Smith America Invents Act, which was largely directed to harmonizing the U.S. patent laws with that of other industrialized nations, did not alter the definiteness requirement of the Patent Act of 1952. Leahy-Smith America Invents Act, Pub. L. No. 112–29, § 4, 125 Stat. at 296 (merely renumbering the previous § 112 ¶2 with § 112(b)).

28. 78 U.S. 516, 541 (1870).

29. *Id.* (discussing the four categories as follows: an invention that embraces the entire machine and therefore requires claims that are co-extensive with the invention; an invention that is one part of a machine thereby requiring the patentee to specify the individual parts; a new ingredient in an old combination thereby requiring more particularity, not only in the new ingredient, but also in the new combination; and where all ingredients are old and the invention is a new combination, the patentee must identify the new combination, the ingredients, the mode of operation, and new and useful result).

30. *Id.* at 542.

31. 242 U.S. 261, 270 (1916).

32. *Id.* at 265–66.

33. *Id.* at 267–69 (discussing three other claims that recited additional limitations such as introduction of heat, and various acids).

desired. By utilizing the patented process, the cost of separating out the ore from gangue was unexpectedly and substantially reduced.³⁴

The procedural history reflects the difficulties of applying the law of definiteness. The district court held that the claims 1–3, 5–7, 8–11, and 12 were valid and infringed.³⁵ It held that the patent specification and claims adequately distinguished the prior art.³⁶ While the district court noted some obstructive behavior by defendants, it did not treble damages.³⁷ The Ninth Circuit reversed.³⁸ The Ninth Circuit ruled that the claims did not distinguish the prior art for purposes of anticipation.³⁹ The Ninth Circuit expressly criticized the district court for giving too much deference to the monetary success of the patented invention in other countries.⁴⁰

The Supreme Court granted the *writ of certiorari* and reversed the Ninth Circuit.⁴¹ It relied upon expert testimony that established the process was novel and simplistic while producing unexpected and cost-effective results.⁴² The Court noted that the “[invention] was immediately accepted as so great an advance over any process known before” and that “it promptly came into extensive use for the concentrations of ores,” including in at least five principal mining countries.⁴³ However, the intrinsic record does not support this holding. The patent-in-suit⁴⁴ has only two figures, both of which are directed to an apparatus. The specification generally discloses a few different processes via operation of the apparatus. It is lacking in detail in relation to the claim limitations.⁴⁵

The Court noted that “the composition of ores varies infinitely, each one presenting its special problem, and it is obviously impossible to specify in a patent the precise treatment which would be most successful and economical in each case.”⁴⁶ The Court also noted that there was a significant amount of prior art concerning the treatment of

34. *Id.* at 266.

35. *Mins. Separation, Ltd. v. Hyde*, 207 F. 956, 962 (D. Mont. 1913) (claims 4, 8, and 11 were not asserted).

36. *Id.* at 960–61.

37. *Id.* at 962.

38. *Hyde v. Mins. Separation, Ltd.*, 214 F. 100 (9th Cir. 1914).

39. *See Hyde*, 214 F. at 109.

40. *Id.* at 107–08.

41. *See Mins. Separation, Ltd. v. Hyde*, 242 U.S. 261, 272 (1916).

42. *Id.* at 270.

43. *Id.*

44. U.S. Patent No. 835,120 (filed May 29, 1905) (issued November 6, 1906).

45. *Id.*

46. *Mins. Separation*, 242 U.S. at 271.

ores.⁴⁷ Based on the record, the Court concluded that the claims are “sufficiently definite to guide those skilled in the art to its successful application, as the evidence abundantly shows.”⁴⁸ The Court reasoned that the “certainty which the law requires in patents is not greater than is reasonable, having regard to their subject matter.”⁴⁹ Hence, use of the word “subject matter” seemingly validated weight on extrinsic evidence as opposed to detailed scrutiny of the intrinsic record.

In 1942, the Court offered additional high-level insight on definiteness. In *United Carbon Co. v. Binney & Smith Co.*,⁵⁰ the patent-in-suit⁵¹ reduces carbon dust liberated during the handling of carbon black, which is used for making rubber products such as tires.⁵² The dust hampered tire production, but efforts to eliminate it were unsuccessful. The Fourth Circuit noted that the approaches resulted in an unusable form of carbon black.⁵³ The inventors solved the problem using a process resulting in a product consisting of carbon black aggregates that did not release carbon dust during subsequent processing.⁵⁴ There were additional advantages to “substantially pure carbon black.”⁵⁵ At issue were claims directed to a product, namely “substantially pure carbon black.”⁵⁶ The Court relied on the testimony

47. *Id.* at 264.

48. *Id.* at 271. The Court relied upon *Ives v. Hamilton*, 92 U.S. 426 (1875). In *Ives*, the Court analyzed the individual components and reasoned that the evidence was sufficient because “[a]ny good mechanic acquainted with the construction of sawmills, and having the patent and diagram before him, would have no difficulty in adopting the [patented] improvement.”

49. *Id.* at 270. By today’s standard, the claims of the patent-in-suit considering the disclosure were unbounded. Claim one read in its entirety “[t]he herein-described process of concentrating ores which consists in mixing the powered ore with slightly-acidified water, adding a small portion of oily liquid having a preferential affinity for metalliferous matter, (amounting to a fraction of one per cent. on the ore), agitating the mixture until the oil-coated mineral matter forms into a froth, and separating the froth from the remainder of the fry flotation.”

50. 317 U.S. 228, 229 (1942).

51. U.S. Pat. No. 1,889,429 (filed Dec. 2, 1927).

52. *United Carbon*, 317 U.S. at 234 n.5 (“The main object of our patented invention is to secure carbon black having the desired dispersive properties, greater density, freedom from dust, freedom from gritty particles, less absorbed or occluded gases, reduced oil absorption than the ordinary powder form, and capable of considerable handling without crushing or dusting.”).

53. *Binney & Smith Co. v. United Carbon Co.*, 125 F.2d 255, 256 (4th Cir. 1942), *rev’d*, 317 U.S. 223 (1942).

54. *Id.*

55. ’429 Patent col. 2 l. 62–80.

56. *United Carbon*, 317 U.S. at 231–32. See ’429 Patent col. 7 l. 8–15, both claims are terse. Claim 1 in its entirety recites “[s]ubstantially [sic] pure carbon black in the form of commercially uniform, comparatively small, rounded, smooth aggregates having a spongy porous interior.” Claim 2 in its entirety claims “[a]n article

of an inventor and corroborating testimony of other witnesses to construe limitations such as “substantially pure,” “commercially uniform,” “comparatively small,” “spongy,” “porous,” “pellet,” and “approximately one-sixteenth of an inch in diameter.”⁵⁷ After reviewing the claim construction, the Court then turned to the issue of definiteness. The Court opined that both claims in question failed to distinguish the prior art and “clearly circumscribe what is foreclosed from future enterprise.”⁵⁸ The Court added that “the claims must be reasonably clear-cut to enable courts to determine whether novelty and invention are genuine.”⁵⁹ Yet, the patent specification suggests that the term “substantially *pure* carbon black” might help distinguish it from “carbon black.”⁶⁰ The Court did not broach this potential interpretation. It instead focused on the issue *de jure*, the impropriety of functional claims.⁶¹

United Carbon and Minerals Separation reflect a subjective and visceral approach to definiteness.⁶² The cases seemingly turn on extraneous facts.⁶³ In *Minerals Separation*, the opinions of three

of manufacture, a pellet of approximately one-sixteenth of an inch in diameter and formed of a porous' mass, of substantially pure carbon black.”

57. *United Carbon*, 317 U.S. at 233–34.

58. *Id.* at 236.

59. *Id.*

60. The patent-in-suit, '429 Patent col. 4 l. 118–19, distinguishes “substantially pure carbon black” from “carbon black.” Although, it also discloses that “the present invention can be employed to manufacture “carbon black” having particular properties. The issue of a special definition for purposes of claim construction was addressed as early as 1919. *See Dayton Eng'g Laboratories Co. v. Kent*, 260 F. 187, 194 (E.D. Pa. 1919) (defendant could not escape infringement by limiting the interpretation of “iron coil” given the special meaning provided by the inventor); *Universal Oil Prods. Co. v. Globe Oil & Refin. Co.*, 137 F.2d 3, 5–6 (7th Cir. 1943), *aff'd*, 322 U.S. 471 (1944); *Autogiro Co. of Am. v. United States*, 384 F.2d 391, 397 (Ct. Cl. 1967) (“Things are not made for the sake of words, but words for things. To overcome this lag, patent law allows the inventor to be his own lexicographer.”).

61. *See United Carbon*, 317 U.S. at 234 (“So read, the claims are but inaccurate suggestions of the functions of the product, and fall afoul of the rule that a patentee may not broaden his claims by describing the product in terms of function”); *Holland Furniture Co. v. Perkins Glue Co.*, 277 U.S. 245, 256–58 (1928) (the Court struggled with the issue of functional claims in relation to the limitations of the invention); *see also Leeds & Catlin Co. v. Victor Talking Mach. Co.*, 213 U.S. 301, 318 (“A process and an apparatus by which it is performed are distinct things. They may be found in one patent; they may be made the subject matter of different patents.”); *Rubber Co. v. Goodyear*, 76 U.S. 788 (1869) (processes as well as products that result are independently patentable subject to novelty).

62. *Exxon Rsch. & Eng'g Co. v. United States*, 265 F.3d 1371, 1375 (Fed. Cir. 2001) (citing *United Carbon* and noting that the standard for definiteness is “easy to state” but “not always [] easy to apply”).

63. *See also Loom Co. v. Higgins*, 105 U.S. 580 (1882). There, the Court took

different courts indicate that the perspective on factors like commercial success may have indirectly impacted the decision.⁶⁴ Similarly, in *United Carbon*, the Court noted that the success associated with the patentees' process for making the patented product was short-lived.⁶⁵ The inference being that the patent grant would exceed the usefulness of the invention.

III. THE FOURTH INDUSTRIAL REVOLUTION

The subjective assessment of definiteness, which continued for decades following *United Carbon*, is misplaced in the 4IR. Since the time the Supreme Court decided *United Carbon*, consumer adoption of new technologies hastened.⁶⁶ It took 75 years for one-hundred million users to adopt the telephone.⁶⁷ By the eve of the 4IR,⁶⁸ it took two years for one-hundred million users to adopt Instagram.⁶⁹ Today,

notice of numerous meetings between the inventor and the accused infringer smacked of inequity, seemingly supporting a more lenient view of the disclosure requirements for purposes of enablement.

64. See, e.g., *Mins. Separation v. Hyde*, 207 F. 956, 959 (D. Mont. 1913) (“Its successful operations, practically from discovery, have recovered, and largely from waste and tailings, values aggregating near \$9,000,000, and at a profit of near \$4,000,000 to the patent owner and its licensees.”); *Hyde v. Mins. Separation*, 214 F. 100, 107–08 (noting that the district court had emphasized “extensive and successful use” but in the U.S. the accused infringer only invested \$60,187); *Mins. Separation v. Hyde*, 242 U.S. 261, 269–70 (referencing that the invention came into use worldwide).

65. At a high level there appears to be a correlation. However, the courts did not expressly link these extraneous facts to their assessment of the definiteness requirement.

66. Rita Gunther McGrath, *The Pace of Technology Adoption is Speeding Up*, HARVARD BUS. REV. (Nov. 25, 2013), <https://hbr.org/2013/11/the-pace-of-technology-adoption-is-speeding-up> [<https://perma.cc/4YC2-ELXV>].

67. Skye Gould, *It Took 75 Years for the Telephone to Reach 100 Million Users . . . And It Took Candy Crush Saga 15 Months*, BUS. INSIDER (July 28, 2015, 10:37 AM), <https://www.businessinsider.com/it-took-75-years-for-the-telephone-to-reach-100-million-users-and-it-took-candy-crush-15-months> [<https://perma.cc/Y98H-7QSM>]. Instagram is a tool used to distribute photographs. The length of time to adopt the telephone related to economic factors such as discretionary income. However, today consumers have greater access to technology. That serves to increase the rate of adoption and change.

68. Klaus Schwab, *The Fourth Industrial Revolution: What it Means, How to Respond*, WORLD ECON. F. (Jan. 14, 2016), <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/> [<https://perma.cc/26Q6-UAAV>] (concluding that the current state of technology is “blurring the lines between physical, digital and biological spheres”).

69. Francis Bea, *What User Backlash? Instagram Now Has 100 Million Users*, DIGITALTRENDS (Feb. 26, 2013), <https://www.digitaltrends.com/social-media/instagram-100-million-users> [<https://perma.cc/YBD5-MBB6>] (“Instagram

industrial leaders know that slow development time equates to losing market share in both existing and emerging markets. At stake is unprecedented revenue in technology sectors, such as biotechnology, artificial intelligence, robotics, communications, and energy storage to name a few. Unlike the siloed and slowly developed innovation of the twentieth century, innovation is now developed at a breakneck pace.⁷⁰ Computerized tools, ICT, and the IoT make this phenomenon possible. It also is the root cause of convergence, which in turn creates challenges to satisfying the definiteness requirement.

A. *Convergence Illustrated*

Just a few years prior to the Court’s decision in *Minerals Separation*, a Swiss-born immigrant named Albert Butz was inventing technology for regulating temperature. He has been recognized as “the father of modern automated control.”⁷¹ One of his 13 patented inventions is entitled the Electric Damper-Regulator (“Butz patent”).⁷² The commercial application of his inventions largely related to regulating the temperature of a coal-fired furnace.⁷³ Claim one of the Butz patent recites components including “a shaft, an electric motor which moves the shaft, an electric brush connected to the shaft and moved thereby, a thermostat in the main circuit, electric generators in the auxiliary circuit . . . [and] a switch between the circuits, to cut out the main circuit containing the thermostat”⁷⁴ These individual components were publicly used on electric trains to transport people as early as 1888.⁷⁵ It illustrates a limited degree of the convergence of mechanical

announced it reach 100 million users, just two and a half years since its launch.”). Notably, Instagram does not take the place of a cellphone. However, in a general sense, a picture conveys a thousand words.

70. See George Stalk, Jr., *Time—The Next Source of Competitive Advantage*, HARVARD BUS. REV. (July 1988), <https://hbr.org/1988/07/time-the-next-source-of-competitive-advantage> [<https://perma.cc/YBM3-68M3>]; see also Klaus Schwab, *The Fourth Industrial Revolution: What it Means, How to Respond*, WORLD ECON. F. (Jan. 14, 2016), <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/> [<https://perma.cc/WB9B-B7YX>].

71. See *Albert Butz*, IMMIGRANT LEARNING CTR. (June 2021), <https://www.ilctr.org/entrepreneur-hof/albert-butz/> [<https://perma.cc/2DVX-QQX2>].

72. Electric Damper Regulator (“Butz patent”), U.S. Patent No. 736,490 (filed Feb. 24, 1902) (issued Aug. 18, 1903).

73. *Albert Butz*, WIKIPEDIA, https://en.wikipedia.org/wiki/Albert_Butz [<https://perma.cc/VDR9-9WT6>] (referring to the patented invention as a “damper flapper”).

74. ’490 Patent.

75. Michael Robbins, *The Early Years of Electric Traction: Invention*,

and electrical technologies. Like those in *United Carbon and Minerals Separation*, the elements of this era were familiar and the corresponding subject-matter comprehensible to the educated layperson.

The company Butz founded, the Butz Thermo-electric Regulator Co., was one of many predecessors to the multibillion dollar conglomerate we know today as Honeywell International (“Honeywell”).⁷⁶ Despite the passage of time, Honeywell products include components that function on the principles disclosed in the Butz patents. U.S. Patent No. 10,541,556 (“Honeywell patent”) confirms this observation.⁷⁷ Like the Butz patent, the Honeywell patent is directed to controlling and operating devices for remotely regulating energy in buildings, which include temperature control.⁷⁸ The specification illustrates, and the claims recite, components that are comprehensible to an educated layperson, *e.g.*, an electricity meter, visual alerts, software, etc. However, the Honeywell patent application also includes various convergent technologies that muddy familiar definiteness waters, such as web application (enterprise demand manager or “EDM”), a universal demand response gateway (“UDG”), a cloud application, demand response (“DR”) automation servers (“DRAS’s”), amongst others.⁷⁹ These acronyms are recited in every claim of the Honeywell patent.⁸⁰

A high-level examination of the Honeywell patent reflects the problematic nature of claiming 4IR-convergent technology. First, 4IR-convergent claim limitations, such as EDM, may not meet the standard for definiteness. Presumably, EDM is customized, application-specific software. The same is true of the UDG. Disclosing of the software programs is not feasible. Second, these elements are fertile ground for those of skill in the art to disagree on definiteness. Third, how does a judge determine whether elements like the EDM are disclosed with

Development, Exploitation, 21 J. OF TRANSP. HIST. 92, 96 (2000).

76. *Albert Butz*, IMMIGRANT LEARNING CTR. (June 2021), <https://www.ilctr.org/entrepreneur-hof/albert-butz/> [<https://perma.cc/2DVX-QQX2>].

77. *See* U.S. Patent No. 736,490 (filed Feb. 24, 1902); U.S. Patent No. 10,541,556 B2 (filed Apr. 27, 2017).

78. ’556 Patent.

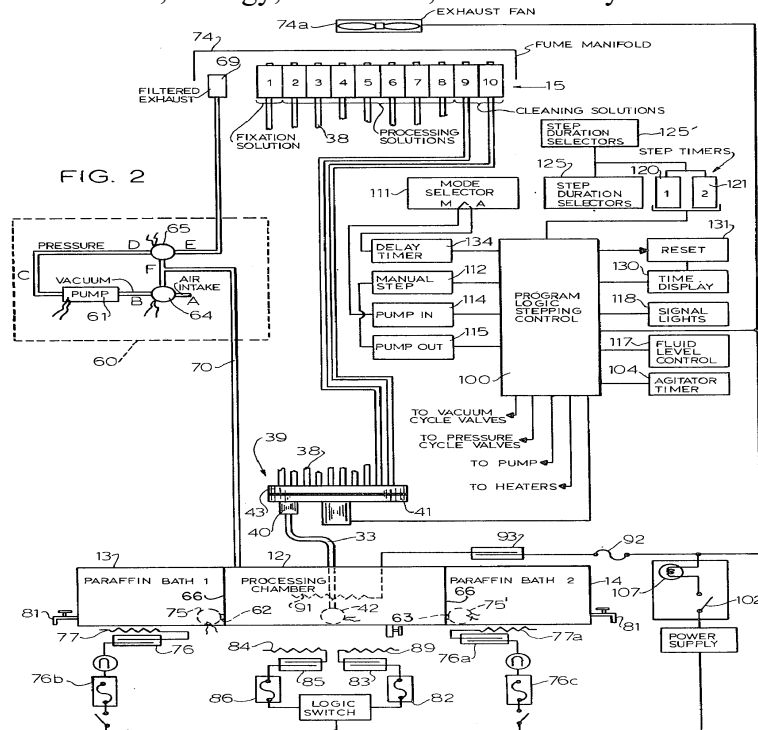
79. *Id.*

80. Patents including convergent technologies do not invariably represent an unbridled amount of technological diversity. However, the European Patent Office reported that patent applications relating to one or two technology fields have fallen from 80 percent in 1990 to 56 percent in 2016. EUROPEAN PATENT OFFICE, PATENTS AND THE FOURTH INDUSTRIAL REVOLUTION 40 (2017). From 2013 to 2016, the European Patent Office also reported that the growth rate of 4IR patent applications increased by 54 percent. *Id.* at 11. In the same period, patent applications in general increased by 7.65 percent. *Id.*; *see, e.g.*, Cryptocurrency System Using Body Activity Data, WIPO Patent No. PCT/US2019/038084 (filed June 20, 2019).

reasonable certainty? Unlike the Butz patent, the Honeywell patent involves a wide array of technological disciplines. For example, an EDM versus an electric motor. The subjective and visceral assessment of definiteness, as gleaned from *United Carbon and Minerals Separation*, may be misplaced in 4IR.

B. Miles Laboratories v. Shandon Inc.

Miles Laboratories v. Shandon Inc. reflects the calculus associated with the definiteness requirement for claims covering convergent technologies.⁸¹ The patents-in-suit involve automated methods and an apparatus for processing tissue specimens for microscopy.⁸² The '460 patent disclosure at Figure 2 illustrates the convergence of chemistry, fluid mechanics, biology, electronics, and thermodynamics.⁸³



Claim 1 includes terms such as “tissue processing solution,” “uniform tissue receptacle,” “a temperature controlled and electrically

81. 997 F.2d 870, 874–75 (Fed. Cir. 1993).

82. *Id.* at 877; U.S. Patent No. 4,001,460 (filed Mar. 5, 1975); U.S. Patent No. 29,073 (filed Aug. 5, 1975) (reissued Dec. 14, 1976).

83. '460 Patent fig.2.

heated processing chamber,” and “pressure sealable top cover” amongst other limitations.⁸⁴ While the district court’s findings on validity and infringement were affirmed, the Federal Circuit noted that the district court incorrectly characterized the “validity challenge as a claim definiteness issue.”⁸⁵ The Federal Circuit also stated that the appellant’s arguments were “possibly relevant . . . to the enablement requirement [] or to utility.”⁸⁶

C. Amgen, Inc. v. Chugai Pharmaceutical

In *Amgen, Inc. v. Chugai Pharmaceutical Co.*,⁸⁷ one of the patents-in-suit, the ’195 patent,⁸⁸ concerns the utilization of recombinant DNA to manufacture a therapeutic agent, purified erythropoietin (“EPO”).⁸⁹ Conventional EPO isolation techniques did not result in significant purification. It was impracticable to mass produce EPO from natural sources like human urine.⁹⁰ The patented invention paved the way for mass production, regardless of whether the EPO purified originates from natural sources or is a bioproduct of genetic engineering.⁹¹

The ’195 claims in question involve “homogeneous erythropoietin” and “[a] pharmaceutical compound to treat anemia.”⁹² The parties did not dispute the claim construction of these terms. The indefiniteness issue revolved around a measurement of specific activity that is useful in quantifying the purification process. During prosecution, the examiner rejected claims directed to a specific activity of “at least 120,000 IU/AU”⁹³ over close prior art having a specific activity of

84. ’460 cols. 10–11.

85. *Miles Labs., Inc.*, 997 F.2d at 875.

86. *Id.*

87. 927 F.2d 1200 (Fed. Cir. 1991).

88. U.S. Patent No. 4,677, 195 cols. 8–9 (filed Jan. 11, 1985).

89. EPO is a hormone that can be used as a therapeutic agent to stimulate red blood cell production. It is helpful for clinically treating anemia. *Amgen, Inc.*, 927 F.2d at 1203. The district court noted that EPO is a complex, three-dimensional protein configuration consisting of 165 amino acids. *Amgen, Inc. v. Chugai Pharm. Co.*, No. 87-2617-Y, 1989 U.S. Dist. LEXIS 16110, at *15–16 (D. Mass. Jan. 30, 1990).

90. U.S. Patent No. 4,470,008 col. 1 (filed July 2, 1982).

91. *Id.* at col. 2 l. 45–68.

92. U.S. Patent No. 4,677,195 col. 8 l. 50–68 (filed Jun. 11, 1985).

93. “Potency of EPO in [one of the patents-in-suit] is stated as its specific activity, expressed as a ratio of International Units (which measures the ability of EPO to cause formation of red blood cells) per absorbance unit (the amount of light absorbed by a sample of EPO measured by a spectrophotometer at a given wavelength, 280 nanometers), i.e., IU/AU.” *Amgen, Inc.*, 927 F.2d at 1215, n. 10.

128,620 IU/AU. To distinguish the invention over the prior art, the applicant responded by amending the specific activity limitation to “at least about 160,000 IU/AU,” which the examiner subsequently allowed.⁹⁴

Specific activity of EPO produced *in vivo*, *i.e.*, produced by genetic engineering, is measured using bioassays.⁹⁵ Expert testimony persuaded the district court that bioassays “provide an imprecise form of measurement with a range of error.”⁹⁶ Thus, use of bioassays “served to neither distinguish the invention over the close prior art of 120,000 IU/AU, nor to permit one to know what specific activity values below 160,000, if any, might constitute infringement.”⁹⁷ The Federal Circuit affirmed the district court’s finding of indefiniteness but added a caveat noting that the indefiniteness finding was limited in scope.⁹⁸ More accurately, it was inconsequential.

D. North American Vaccine, Inc. v. American Cyanamid Co.

North American Vaccine, Inc. v. American Cyanamid Co.,⁹⁹ decided three years later, also involved complex subject matter. The patent-in-suit is directed to a vaccine that boosts human infants’ immune system against life threatening bacterial infections, such as meningitis.¹⁰⁰ The only independent claim includes the limitation “linkage to a termination portion of the polysaccharide *without significant cross-linking*.”¹⁰¹

The district court noted that a polysaccharide can be crudely conceptualized as a string in that it has two ends.¹⁰² As such, there are

94. *Id.* at 1217–18.

95. *Id.* at 1216, 1218.

96. *Id.* at 1217.

97. *Id.*

98. “We also note that, in view of our reversal of the district court’s holding that claims 1 and 3 are invalid [for lack of enablement], claims 4 and 6 [upon which they depend] would also be invalid without the “about” limitation. In arriving at this conclusion, we caution that our holding that the term “about” renders indefinite claims 4 and 6 should not be understood as ruling out all uses of this term in patent claims.” *Id.* at 1218. The comment serves to remind the patent community that claim language such as “about” is not *per se* indefinite. *See, e.g.*, W.L. Gore & Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1557 (Fed. Cir. 1983) (“use of ‘stretching . . . at a rate exceeding about 10% per second’ in the claims is not indefinite”).

99. 7 F.3d 1571 (Fed. Cir. 1993).

100. U.S. Patent No. 4,356,170 (filed May 27, 1981).

101. *Id.* at col. 2 (emphasis added).

102. For purposes of immunization, the accused product, marketed as HibTITER,

three potential interpretations concerning linkage to a polysaccharide. The polysaccharide can be linked at one terminal end, called a monomer. There can be linkage at both ends of the polysaccharide, often referred to as difunctional or a dimer. Both monomers and dimers therefore exhibit end-to-end “crosslinking.”¹⁰³ It is also possible to link proteins along the backbone of the polysaccharide, called trimers. The district court determined that, based on extrinsic evidence, Dr. Jennings directed his invention to a monomer because it was a better formulation for inoculation of children.¹⁰⁴ Hence, the district court concluded that the term “without significant crosslinking” is properly construed as a monomer.¹⁰⁵ Given the accused product was difunctional, the court ruled that there was no infringement.¹⁰⁶

On the issue of definiteness, the district court took umbrage with the number of polysaccharides that fell within the scope of the claims as construed, many of which would yield varied results.¹⁰⁷ Indeed, the parties entered a stipulation to eliminate various categories of polysaccharides.¹⁰⁸ Despite the parties’ agreement, the district court reasoned

adds a protein via chemical linkage at each end of this string. Thus, it was crucial to defendant’s infringement case to urge upon the court that the language in claim 11 should mean literally what it says: that it is a claim in which there is linkage at one terminal portion of the polysaccharide, not at both ends. The district court ruled from the bench on the issues of claim construction and definiteness. The transcript reflects the judge’s firm grasp of the underlying subject matter. *N. Am. Vaccine, Inc. v. Am. Cyanamid Co.*, No. 91 Civ. 1449, 1992 U.S. Dist. LEXIS 13476, at *5-6 (S.D.N.Y. Sept. 9, 1992).

103. *Id.* at *12–13, 15, 20–26.

104. *Id.* at *7 (“Now, some of the work in this field involved methods which placed a great deal of protein matter on the polysaccharide, that protein matter being distributed all along the length of the polysaccharide. The problem with this was that there was too little polysaccharide left exposed, and I think the evidence refers to this problem as being that the immune system of the infant would not recognize the polysaccharide. In any event, covering the polysaccharide with protein or having a lot of protein along the length was a problem. As we know from the evidence in this case, that which I have just called a problem perhaps was not perceived by everyone as a problem, because certain parties developed products in which this situation occurred where there was protein distributed along the length of the polysaccharide. But at least to some scientists it was viewed as a problem, and certainly it was viewed as a problem by Dr. Jennings.”).

105. *Id.* at *19–21.

106. *Id.* at *24–26.

107. *Id.* at *8–9.

108. *Id.* at *21–22 (“It has been stipulated that if the [inventor’s] oxidation process were applied to all of these serotypes of the five groups referred to in claim 12, some would produce a monofunctional result. Some would produce a difunctional result. Some would produce a polyfunctional result; that is, protein distributed all along the polysaccharide.... And I think it is clear from the record that on some of these

that the stipulation only served to highlight the issue of uncertainty in claim scope.¹⁰⁹ It held that the claims were indefinite.¹¹⁰ On appeal, the majority affirmed the narrowest claim construction.¹¹¹ However, regarding the holding of indefiniteness, the Federal Circuit reversed.¹¹² It relied on extrinsic evidence, namely testimony from the accused infringer's expert. The expert opined that in a hypothetical laboratory, one of skill in the art could rule out various polysaccharides.¹¹³

E. Difficulties with Definiteness

Miles Laboratories, Amgen, and North American Vaccine raise questions as to whether *United Carbon and Minerals Separation* are obsolete, or at the very least, in need of rethinking. *Miles Laboratories* illustrates that the district court understood the convergent technology and correctly decided validity and infringement. However, it is evident that the district court as well as the appellant confused definiteness with other doctrines concerning claim scope.

In *Amgen*, the claim-related issues overshadowed the definiteness inquiry. Without any accurate means to measure “at least about 160,000 IU/AU,” one of skill in the art could not practice the invention.¹¹⁴ Other claim terms also lacked enablement.¹¹⁵ Not surprisingly, the Federal Circuit marginalized definiteness in favor of enablement.

serotypes, it is not known what would happen. In addition, it is stipulated that on some of these serotypes which would not naturally and easily yield the monofunctional result, such a result could be obtained if there was pretreatment of the kind taught at an earlier point in the patent.”).

109. *Id.* at *22.

110. *Id.* at *24.

111. On appeal, the majority affirmed the district court's claim construction and the finding of no infringement. Judge Rader dissented. In part, he disagreed with the majority's claim construction of “without significant cross-linking.” Judge Rader believed that the majority's construction of this term was unduly narrow. Judge Rader set out a thorough, factual, and well-reasoned dissent showing that the claims and intrinsic record support a broader claim scope, namely covering both monomers and dimers. *N. Am. Vaccine Inc.*, 7 F.3d at 1578, 1582–83 (Rader, J., dissenting).

112. *Id.* at 1580.

113. *Id.*

114. “[T]he inventor failed to provide a patent disclosure sufficient to enable one skilled in the art to carry out the invention commensurate with the scope of the claims.” *Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200, 1213, 1217–18 (Fed. Cir. 1991).

115. Specifically, “homogeneous erythropoietin” or “[a] pharmaceutical compound to treat anemia” were not enabled. *Id.* at 1203.

The Federal Circuit even added a caveat to limit the precedential value of its indefiniteness holding.¹¹⁶

North American Vaccine demonstrated two problems. First, like *Miles Laboratories* the parties and district court confused definiteness and other claim-related doctrines, namely utility and enablement.¹¹⁷ Second, the court excluded extrinsic evidence in the form of the inventor's articles for purposes of claim construction because "[p]atents often teach embodiments not carried out in the laboratory."¹¹⁸ However, the court allowed extrinsic evidence concerning hypothetical laboratory experiments for purposes of definiteness.¹¹⁹ It illustrates the tension between claim interpretation and definiteness.

From these modern cases, it is questionable whether the old precedent can promote certainty and uniformity in 4IR, especially given confusion with other claim-specific doctrines like enablement, claim construction, and utility. It signaled the need for a new standard.

116. *Id.* at 1218.

117. The accused infringer contended "that claims 12 and 25 are invalid because they do not really teach anything." *N. Am. Vaccine, Inc. v. Am. Cyanamid Co.*, 1992 U.S. Dist. LEXIS 13476, at *24 (S.D.N.Y. Sep. 9, 1992). The district court agreed for purposes of determining definiteness, but the argument is relevant to utility or enablement. The Federal Circuit gratuitously added that neither theory was raised on appeal. *N. Am. Vaccine, Inc.*, 7 F.3d at 1579 ("The fact that dependent claims include species which might not meet the objects of the invention does not by itself prove that one skilled in the art cannot ascertain the scope of the asserted claims. That objection goes to possible inoperativeness under 35 U.S.C. § 103 or lack of enablement under 35 U.S.C. § 112, first paragraph, neither of which provisions are before us.").

118. *N. Am. Vaccine, Inc.*, 7 F.3d at 1578. More specifically, the Federal Circuit noted that the district court erred by using the inventor's papers and speech to buttress its finding of a narrow claim scope. It deemed it harmless error given other persuasive arguments. However, the district court also found that the claim term "polysaccharide" applied to so many proteins that it rendered the claim scope indefinite. While the Federal Circuit agreed, it relied on the expert testimony concerning hypothetical lab results to narrow the claim term "polysaccharide" for purposes of holding that the patent was definite. *Id.*

119. In narrowing the scope of "polysaccharides" for purposes of reversing the finding of indefiniteness, the Federal Circuit relied upon the patent holder's expert testimony about what he "think[s]" he can [probably] rule out in a hypothetical laboratory. *Id.* at 1580. The expert testified that "[i]t's understood by everyone working in the field that you first draw out from [the group of bacterial types in claim 12] the particular types that are relevant to infantile meningitis, and then I think, as a scientist, I would look at the structure of the polysaccharides from those types and I would say are they structures that would, when subjected to this process, leave a backbone that's antigenic and probably, therefore, effective as a vaccine. *Id.* (emphasis added).

IV. *EXXON*: THE INSOLUBLY AMBIGUOUS STANDARDA. *The Technology and Procedural History*

The procedural history in *Exxon Research & Engineering Co. v. United States*¹²⁰ presented an opportunity to rethink the standard for definiteness. In *Exxon*, the patentee, Exxon Research, alleged that the United States infringed two patents directed to improvements in the Fischer-Tropsch process.¹²¹ This chemical process converts natural gas into petroleum and other liquid hydrocarbon byproducts. The process relates to breaking down natural gas into a synthesis gas. The synthesis gas is introduced into a “slurry bubble column reactor.”¹²² A column in the reactor contains solid catalyst particles in liquid suspension. When the synthesis gas is introduced to the catalyst particles under carefully controlled conditions, the synthesis gas reacts with other products to form liquid hydrocarbons. Exxon Research’s patented inventions are directed to solving problems that made the Fischer-Tropsch process impractical for widespread commercial use.¹²³

The patents-in-suit, U.S. Pat. Nos. 5,292,705 (“’705 patent”) and 5,348,982 (“’982 patent”) are directed to improving the operation of a slurry bubble column reactor.¹²⁴ The ’705 patent teaches how to increase the productivity of the catalyst.¹²⁵ The only independent claim of the ’705 patent includes the claim limitation “*period sufficient to increase substantially the initial catalyst productivity.*”¹²⁶ The ’982 patent teaches how to optimize operation of the slurry bubble column.¹²⁷ The only independent claim of the ’982 patent includes the claim limitations “*substantial absence of slug flow,*” “*fluidizing the . . . catalyst particles . . . to height, $H > 3m,$* ” “*particles of average diameter,*” and the term “*UL,*” which relates to liquid velocity along the slurry bubble column reactor.¹²⁸

120. 265 F.3d 1371 (Fed. Cir. 2001), *abrogated by* *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898 (2014).

121. *Id.* at 1373.

122. *Id.* at 1380.

123. *Id.* at 1377.

124. *Id.* at 1373.

125. *Id.*

126. *Id.* at 1374.

127. *Id.*

128. *Id.* Suffice it say that the intrinsic record includes complicated engineering-related information including chemical reactions, equations, process variables, illustrations, etc.

The trial court docketed a date for claim construction. In its claim construction brief, the patent challenger “determined that it could not propose a definition for certain terms because they were indefinite.”¹²⁹ In response, Exxon asked the trial court to take the claim construction hearing off the docket and instead proceed directly to trial on liability issues, including claim construction, validity, and infringement. For purposes of judicial economy,¹³⁰ the trial court rejected Exxon’s proposal, postponed the claim construction hearing, and focused its attention on definiteness. After briefing and oral argument, the trial court granted summary judgment that both patents were indefinite.¹³¹

The trial court and Federal Circuit alike acknowledged numerous ambiguities in the patent disclosures. For example, different equations lead to different results in relative catalyst productivity, thereby calling into question the claim term “increase substantially.”¹³² Likewise, the specification did not expressly reference an upper or lower limit associated with the claim term “for a period sufficient.”¹³³ There are no empirical boundaries for the term “substantial absence of slug flow.”¹³⁴ The parties contested whether there was one or two measurements for “H,” the height of the column.¹³⁵ An upper limit for “particles of average diameter”¹³⁶ is not specified in the specification.

B. A Construable Claim is Definite

While the law on definiteness remained unchanged since *United Carbon*, in the years preceding *Exxon*, the tenants of claim construction evolved.¹³⁷ Hence, *Exxon* is unique in that a decision on

129. *Exxon Rsch. & Eng’g Co. v. United States*, 46 Fed. Cl. 278, 281 (2000).

130. The trial court reasoned that “indefiniteness should be considered separate from claim construction on a motion for summary judgment . . . [I]f some claims were held to be indefinite, there would be no reason to construe other claims about which the issue of indefiniteness had not been raised.” *Id.*

131. *Id.* at 291, 302.

132. *Exxon Rsch.*, 265 F.3 at 1377.

133. *Id.* at 1378. The Federal Circuit noted that a lower boundary was sufficient to determine “for a period sufficient.” *Id.* It reasoned that the variations depend on changes in the catalyst and process conditions which would be reasonably precise to one of skill in the art considering the subject matter. *Id.* The lower limit could be about 0.25 hours and preferably 0.5 hours. *Id.*

134. *Id.* at 1380.

135. *Id.* at 1381.

136. *Id.* at 1382.

137. For example, in *Markman v. Westview Instruments*, the Supreme Court held that the trial judge, and not the jury, is best suited to determine the scope of patent

definiteness was made without any findings on claim construction. At the beginning and end of the opinion concerning indefiniteness, the Federal Circuit in *Exxon* recited cases applying the “reasonable certainty” standard.¹³⁸ However, in the middle, the Federal Circuit articulated a standard for definiteness using newly minted language:

If a claim is insolubly ambiguous, and no narrowing construction can be properly adopted, we have held the claim indefinite. If the meaning of the claim is discernable, even though the task may be formidable and the conclusion may be one over which reasonable persons disagree, we have held the claim to be sufficiently clear to avoid invalidity to avoid invalidity on indefiniteness ground.¹³⁹

Without saying as much, the Federal Circuit’s “insolubly ambiguous” language inextricably linked claim construction and definiteness.¹⁴⁰ The nexus between claim construction and validity in a broader sense

claims. 571 U.S. 370 (1996). Even though there was no question of definiteness in *Markman*, the Court reiterated its own rationale in *United Carbon*, namely, to promote uniformity and avoid “zone[s] of uncertainty.” *Id.* at 388–90. Subsequently, the Federal Circuit *en banc* ruled that claim construction is entirely free of factual findings, hence, purely a question of law. *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1456 (Fed. Cir. 1998) (en banc). The Supreme Court, in *Teva Pharmaceuticals USA, Inc. v. Sandoz, Inc.*, overturned the *Cybor* line of cases and held that claim construction may include findings of fact and that as such, they are reviewed on appeal under the more deferential clearly erroneous standard. 574 U.S. 318 (2014). See, e.g., Donald R. Dunner & Howard A. Kwon, *Cybor Corp. v. FAS Technologies: The Final Say on Appellate Review of Claim Construction?*, 80 J. PAT. & TRADEMARK OFF. SOC’Y 481, 497 (1998) (“The Federal Circuit’s plenary authority over the claim construction process may have harsh results in practice and may undermine the judicial role of the district courts in patent litigation.”).

138. *Exxon Rsch.*, 265 F.3d at 1375–76, 1382.

139. *Id.* at 1375.

140. After seven years of applying the “insolubly ambiguous” standards, the Federal Circuit noted that “we have held claims indefinite where a claim recites means-plus-function elements without disclosing corresponding structure in the specification, *Biomedino, LLC v. Waters Techs. Corp.*, 490 F.3d 946, 950 (Fed. Cir. 2007), includes a numeric limitation without disclosing which of multiple methods of measuring that number should be used, *Honeywell Int’l, Inc. v. Int’l Trade Comm’n*, 341 F.3d 1332, 1340 (Fed. Cir. 2003), and contains a term that is ‘completely dependent on a person’s subjective opinion.’ *Datamize, LLC v. Plumtree Software*, 417 F.3d 1342, 1350 (Fed. Cir. 2005). We have also stated that a claim could be indefinite if a term does not have proper antecedent basis where such basis is not otherwise present by implication, or the meaning is not reasonably ascertainable. *Energizer Holdings, Inc. v. Int’l Trade Comm’n*, 435 F.3d 1366, 1370–71 (Fed. Cir. 2006). The common thread in all these cases is that *claims were held indefinite only where a person of ordinary skill in the art could not determine the bounds of the claims, i.e., the claims were insolubly ambiguous.*” *Halliburton Energy Servs., Inc. v. M-I LLC*, 514 F.3d 1244, 1249 (Fed. Cir. 2008) (emphasis added).

is not without legal support.¹⁴¹ In *Smith v. Snow*,¹⁴² the Supreme Court held that “if the claim [is] fairly susceptible of two constructions, that should be adopted which will secure to the patentee his actual invention.”¹⁴³ Indeed, *Smith* was cited in *Exxon*. What appears to be a logical extension of *Smith v. Snow*, however, is not at all discernable from *Minerals Separation* or *Union Carbon*.¹⁴⁴

141. See *Athletic Alts., Inc. v. Prince Mfg., Inc.*, 73 F.3d 1573, 1581 (Fed. Cir. 1996) (adopting the narrower claim construction to avoid invalidating the claim). More specifically, the Federal Circuit held that a claim is indefinite when it is incapable of being construed, *i.e.*, when it is “insolubly ambiguous.” See *id.* The Federal Circuit explained that under its own precedent, a patent claim is invalid for indefiniteness “only when it is ‘not amenable to construction’ or ‘insolubly ambiguous.’” *Biosig Instruments, Inc. v. Nautilus, Inc.*, 715 F.3d 891, 898 (Fed. Cir. 2013) (quoting *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1347 (Fed. Cir. 2005)). Under that standard, the *Exxon* court said that a claim is indefinite if it cannot meaningfully be construed or “if reasonable efforts at claim construction result in a definition that does not provide sufficient particularity and clarity to inform skilled artisans of the bounds of the claim.” *Id.* at 898 (quoting *Star Sci., Inc. v. R.J. Reynolds Tobacco Co.*, 537 F.3d 1357, 1371 (Fed. Cir. 2008)).

142. 294 U.S. 1 (1935).

143. See *id.* at 14 (in which the Court stated that “if the claim [is] fairly susceptible of two constructions, that should be adopted which will secure to the patentee his actual invention,” the Court narrowed the claim interpretation in order to avoid invalidating the claim (*citing* *Keystone Mfg. Co. v. Adams*, 151 U.S. 139, 144–45 (1894)); *Modine Mfg. Co. v. U.S. Int’s Trade Comm’n*, 75 F.3d 1545, 1557 (Fed. Cir. 1996) (rejecting indefiniteness argument after construing claims; stating that “when claims are amenable to more than one construction, they should when reasonably possible be interpreted to preserve their validity” (*citing* *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577 (Fed. Cir. 1984)); *Athletic Alts., Inc. v. Prince Mfg., Inc.* 73 F.3d 1573, 1581 (Fed. Cir. 1996) (choosing the narrower of two equally plausible claim constructions in order to avoid invalidating the claim); *cf. id.* at 1583 (Nies, J., concurring) (“I do not agree that the adoption of the narrower of two equally plausible interpretations should somehow flow from the requirement of 112 ¶ 2. . . . The majority analysis is illogical to me. Narrowness cannot be equated with definiteness.”).

144. Compare *Smith v. Snow*, 294 U.S. 1 (1935), with *Mins. Separation v. Hyde*, 242 U.S. 261 (1916), and *United Carbon Co. v. Binney & Smith Co.*, 317 U.S. 228 (1942). There are cases that evidenced that the two can remain distinct. For example, in *Pure Choice, Inc. v. Honeywell Int’l, Inc.*, there, the inquiry remained distinct. 333 F. App’x 544, 548–549 (Fed. Cir. 2009) (nonprecedential decision). However, upon closer examination, it appears that was the result of the parties’ litigation-related decisions. *Id.* at 546. In *Honeywell*, the claim at issue related to an air quality monitoring system. *Id.* Claim one recited the following limitations: An air quality monitoring system comprising: a data acquisition system for collecting *air quality data* at a data acquisition site, said data acquisition system including: at least one sensor for measuring environmental air quality data; *Id.* at 545–46. The district court construed the claim “air quality data” as a “concentration of pollutants or contamin[ants] in the air.” *Id.* at 54–47. The district court concluded that the reissued claim as construed was “insolubly ambiguous.” *Id.* at 547. The Federal Circuit affirmed both the district court’s claim construction and the finding of indefiniteness. *Id.* at

V. *NAUTILUS*: THE SUPREME COURT OVERTURNS *EXXON*A. *Returning Definiteness to 1870*

Thirteen years after *Exxon*, the Federal Circuit applied the “insolubly ambiguous” standard and overturned a summary judgment decision that found the patent in question to be indefinite. Subsequently, the Supreme Court granted the patent challenger’s petition for writ of *certiorari*. Unlike *Exxon*, in *Nautilus, Inc. v. Biosig Instruments, Inc.*,¹⁴⁵ the invention disclosed in the patent-in-suit is simple: a handle on exercise equipment having electrodes connected to garden-variety circuitry and a heart-rate monitor.¹⁴⁶

The handle, *i.e.*, an “elongate member,” is arranged so that each hand of the user contacts a “live electrode” and a “common electrode.” Figure 1 of the patent-in-suit illustrates the “elongate member.” The electrodes are connected to well-known circuitry that conditions the electric signals for subsequent processing by a heart rate monitor. The purpose of this arrangement is intended to improve the accuracy of measuring electrocardiograph (“ECG,” also referred to as “EKG”) signals associated with the electroactivity of the heart. It does so by electronically attenuating unwanted noise associated with electromyogram signals (“EMG”), which emanates from muscles.¹⁴⁷

The district court was troubled by specific details corresponding to the recited elements¹⁴⁸ that were not disclosed in the intrinsic

548–49. The parties did not ask the court to construe terms such as “environmental air quality data” or “non-weather data.” *See generally id.* Based on the intrinsic record and the claim construction that followed, these terms are incapable of construction. *Id.* at 545. The claim as issued recited only one “sensor” and it was used “for measuring air quality data.” *Id.* at 546. During reexamination, the claim was amended to include two sensors, one for measuring “environmental air quality data” and the other “non-weather data.” *Id.* However, the term environmental data was disavowed prior to reexamination to the extent it extended beyond the term air quality data as construed. *Id.* There was no definition of “environmental” or “non-weather data” in the written description to support the claim allowed during reexamination. *Id.* Further, the applicant did not summarize its interview with the examiner to reflect the basis for including variables into the reexamined claim, thereby circumnavigating 37 C.F.R. § 1.560(b). *Id.* at 549. This case demonstrates that while the claim construction and definiteness can remain separate, it is unlikely. *See generally id.*

145. 572 U.S. 898 (2014).

146. U.S. Patent No. 5,337,753 (filed June 9, 1992).

147. *Nautilus*, 572 U.S. at 898.

148. The only independent claim in the ’753 patent recites in part an “elongate member” having two halves, with “a first live electrode and a first common electrode

record. For example, the composition of the handle was unspecified. The electrodes could be placed “between two middle fingers, the outer first and fourth finger, the thumb underneath and fingers on top”¹⁴⁹ The users’ hands could be small or large, thereby potentially affecting the scope of the “spaced relationship” claim term. The district court noted that it

found nothing in evidence that provided how a skilled artisan would have determined the appropriate parameters yielding the necessary ‘spaced relationship’ as recited by the ‘753 patent: what [the expert] says is that through trial and error, which he doesn’t describe, one can find a spaced relationship. That may be. But there’s no description.¹⁵⁰

The district court construed the claim term “spaced relationship” to mean that “there is a defined relationship between the live electrode and the common electrode on one side of the cylindrical bar and the same or a different defined relationship between the live electrode and the common electrode on the other side of the cylindrical bar.”¹⁵¹ The district court granted Nautilus’s motion for summary judgment. It opined that the claim limitation “spaced relationship” was indefinite.¹⁵²

B. *Absolute Precision and Malevolence*

In overturning *Exxon*’s standard for determining definiteness, the Court stated that the Federal Circuit’s “insolubly ambiguous” standard placed the judge in a difficult position¹⁵³ of seeking “absolute precision.”¹⁵⁴ The Supreme Court also opined that patent applicants would

mounted on said first half in a spaced relationship with each other” and “a second live electrode and second common electrode on said second half in a spaced relationship with each other.” ’753 Patent, col. 5 ll. 17–36.

149. *Biosig Instruments, Inc. v. Nautilus, Inc.*, 715 F.3d 891, 901 (2013).

150. *Id.*

151. *Id.* at 899.

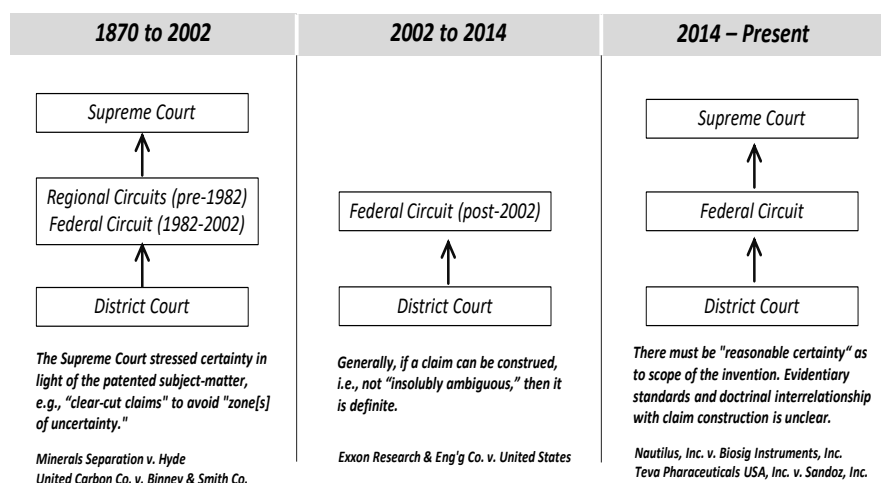
152. *Id.*

153. *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 911 (2014) (noting that the Federal Circuit’s standard for indefiniteness “can breed lower court confusion . . .”).

154. In 1922, Albert Einstein noted “[i]t is mathematics which affords the exact natural sciences a certain measure of security, to which without mathematics they could not attain.” Albert Einstein, *Geometry and Experience*, MACTUTOR (last updated Apr. 2007), https://mathshistory.st-andrews.ac.uk/Extras/Einstein_geometry/ [<https://perma.cc/62B4-A6E3>]. Einstein was a former clerk in the Swiss patent office and inventor of fifty patents. The quote was not directed to patent law. However, the observation undermines the role of reasonable certainty. In practice, *Exxon* did not

succumb to “powerful incentives to inject ambiguity into the [patent] claims.”¹⁵⁵ The Supreme Court revived the reasonable certainty standard articulated in *Minerals Separation* and *United Carbon*. In so doing, the Court dialed the definiteness requirement back to the previous century. The chart below illustrates the judicial standards used for assessing definiteness since the Patent Act of 1870 codified the requirement.

Evolution of Definiteness Standards in Court



require district courts to seek “absolute precision.” The standard required nothing beyond applying the modern canons of claim construction, which requires no more precision than that gleaned from the intrinsic record. In fact, one can credibly argue that claim construction requires “absolute precision.” For that reason, the Court’s reasoning is questionable.

155. *Nautilus, Inc.*, 572 U.S. at 910. The dreaded injection, “spaced relationship,” is hardly the calling card of the dastardly Professor Moriarty. Design arounds, commensurate licenses, anticipation, obviousness, enablement, and claim interpretation are well-known antidotes. A critical clue is the entity that recited this imagery—an “amicus” tech giant. Distinguished patent colleagues aptly noted that “[t]ech [g]iants, anxious to stave off competition, have worked tirelessly, under the guise of ‘reform,’ to undermine the value of U.S. Patents.” Paul R. Michel & Matthew J. Dowd, *America’s Innovators Need Clear Patent Laws*, WALL ST. J. (Jan. 23, 2020), <https://www.wsj.com/articles/americas-innovators-need-clear-patent-laws-11579824646> [<https://perma.cc/P2DE-X8JU>]. As early as the 90’s, tech giants also insisted on stringent “price caps” for the outside counsel that drafted patent applications. Their “powerful incentives” include reducing legal costs and gaining status via highly publicized rankings based on superficial annual metrics. The purpose of the patent system is undermined by tech giants seeking to boost numbers by filing inexpensive, low quality patent applications directed to trivial technological features.

Upon remand, the Federal Circuit for a second time reversed the district court's grant of summary judgment, reaffirming its prior holding.¹⁵⁶ The case was remanded for further proceedings. The Federal Circuit noted that the "[Supreme] Court has accordingly modified the standard by which lower courts examine allegedly ambiguous claims: we may now steer by the bright star of 'reasonable certainty,' rather than the unreliable compass of 'insoluble ambiguity.'"¹⁵⁷ At the present time and for the foreseeable future, the patent community will navigate the Supreme Court's definiteness standard using the "bright star" of *Nautilus*.

VI. CONCERNS WITH *NAUTILUS*

Justice Ginsburg¹⁵⁸ authored the *Nautilus* opinion. The claimed invention is a simple, relatively siloed technology. As a result, the application of *United Carbon* is logical. The decision was unanimous, but none of the justices had appreciable education or experience

156. See *Biosig Instruments, Inc.*, 783 F.3d 1374 (Fed. Cir. 2015).

157. *Id.* at 1379. The Federal Circuit's sarcasm was as much as anything rooted in the Supreme Court's on-going assault of Federal Circuit precedent. See Lawrence Hurley, *For U.S. High Court, A Year of Discontent With Patent Rulings*, REUTERS (June 19, 2014), <https://www.reuters.com/article/us-usa-court-ip-analysis/for-u-s-high-court-a-year-of-discontent-with-patent-rulings-idUSKBN0EU2SV20140619> [<https://perma.cc/DC5M-HPS8>]. See also, *Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 135 S.Ct. 831, 843 (2015) (in an appeal concerning the appropriate appellate standard used for factual findings on claim construction, the Supreme Court was uncharacteristically blunt, stating that "the Federal Circuit was wrong"). There is no denying that the judges of the Federal Circuit are highly experienced with modern technology, certainly more so than the "elongate member" in *Biosig Instruments' U.S. Patent No. 5,337,753*. The Court has technical advisors available as needed, and exclusively handles appeals from the patent office, ITC, and federal courts. Indeed, in the *Exxon* case, the Federal Circuit noted that it "engages in claim construction 'every day.'" *Exxon Rsch. & Eng'g Co. v. United States*, 265 F.3d 1371, 1375 (Fed. Cir. 2001). The Federal Circuit also readily appreciates the realities associated with patent practice. As a result of the Supreme Court's decision in *Alice Corporation Pty. Ltd. v. CLS Bank International*, over five hundred patents were invalidated in a matter of five years. 573 U.S. 208 (2014). See Mark A. Lemley & Samantha Zyontz, *Does Alice Target Patent Trolls?* 18 J. EMPIRICAL LEGAL STUD. 47 (2021).

158. Upon her passing, Chief Justice John Roberts said "[t]oday we mourn but with confidence that future generations will remember Ruth Bader Ginsburg as we knew her, a tireless and resolute champion of justice." Among many historic accomplishments, Justice Ginsburg is often credited for her contributions to gender equality. See, e.g., *United States v. Virginia*, 518 U.S. 515, 549 (1996) ("[E]stimates of what is appropriate for *most women* . . . no longer justify denying opportunity to women whose talent and capacity place them outside the average description. Notably, Virginia never asserted that VMI's method of education suits *most men*." (emphasis original)).

concerning complicated technologies. The Supreme Court tends to give deference to old precedent,¹⁵⁹ which may be a weak foundation for technology-dependent doctrines in the 4IR.

A. *The 4IR Ecosystem*

The business realities of the 4IR include greater competition, limited funding, the increasing pace of innovation, and rapid consumer adoption. From the perspective of business leaders, the time to market is more important than filing patents. Likewise, since as early as 1990, a multitude of large tech companies “capped” the prices for preparing and prosecuting patent applications.¹⁶⁰ By doing so, they “commoditized” patent preparation and prosecution.¹⁶¹ Emerging enterprises, which cannot benefit from economies of scale, often relegate patent protection to the bottom of the proverbial “to do” list because of budgetary constraints.

The development of the CMOS image sensor¹⁶² (“CMOS sensor”) is illustrative of how patenting is a small part of a bigger process. It also demonstrates how the reasoning of *Nautilus* is philosophical but not realistic. The CMOS sensor makes possible the miniaturization of a camera. The first commercially viable CMOS sensor was invented at the California Institute of Technology’s Jet Propulsion Laboratory (“JPL”). The priority document of this revolutionary invention was a provisional patent application¹⁶³ (“provisional”) consisting entirely of the inventors’ scientific publications. Filing the provisional patent in

159. In a decision involving the first sale doctrine, which is not technology-dependent, the Supreme Court noted Lord Coke’s decision on restraints of alienation for real property. Lord Coke served as Chief Justice of the King’s Bench in 1613. *Impression Prods. v. Lexmark Int’l, Inc.*, 137 S. Ct. 1523, 1526, 1538 (2017) (Lord Coke’s reasoning concerned the unenforceability of restraints on the alienation of property) (Justice Ginsburg dissenting because “a sale abroad [for purposes of patent exhaustion] operates independently of the U.S. patent system . . .”).

160. See generally Gene Quinn, *Saving Money by Slashing Patent Attorney Fees Wastes Every Dollar*, (May 29, 2018), <https://www.ipwatchdog.com/2018/05/29/saving-money-slashing-patent-attorney-fees/id=97877/> [<https://perma.cc/6J8P-4596>].

161. *Id.*

162. Active Pixel Sensor with Intra-Pixel Charge Transfer, U.S. Patent No. 5,471,515 (filed Jan. 28, 1994) (issued Nov. 28, 1995).

163. See *Chinsammy v. United States*, 95 Fed. Cl. 21, 25 (2010), *aff’d* 417 Fed. Appx. 950 (Fed. Cir. 2011) (“A provisional patent application is not actually examined by the patent office but serves to establish a priority date if the inventor subsequently files the standard, non-provisional patent application.”).

this manner was an “eleventh hour” stopgap measure to avoid a bar on patentability resulting from the inventors’ own publications. In the patent application that followed, the claims as filed did not recite the point of novelty, an “active pixel sensor.”¹⁶⁴ The examiner subsequently allowed the defective, technically broadened, claims. As is more often the case, there was no malevolent injection of ambiguity. The market realities of the 4IR were to blame. Yet, competition was not stymied. A technology license on the patent applications secured the monetary resources necessary to commercialize the CMOS sensor technology. In the first three quarters of 2019, 24 years after the patent issued, the Sony subsidiary that manufactures CMOS sensors recorded the highest operating profit among any Sony division.¹⁶⁵ Today there are CMOS sensors in manufacturing, security, medical equipment, automobiles, cellphones, airplanes, and satellites.

In the nineteenth and early twentieth century, development timelines were long, the technologies were siloed, and the market was slow to adopt new technologies.¹⁶⁶ The syntax associated with claim drafting was evolving. For example, *United Carbon* and *GE Co. v. Wabash Appliance Co.*¹⁶⁷ addressed the issue of using functional claim language. Functional claims are unduly broad. Yet, *Nautilus* adopted the reasoning without accounting for historical context. “Reasonable certainty” of patent claims will reduce certainty and uniformity as technology increases in complexity and converges. Determining the

164. U.S. Patent No. 11/818453 (filed June 14, 2007).

165. River Davis, *It’s All Smiles at Sony as Smartphone Cameras Boost Demand for Its Image Sensors*, WALL STREET J. (Feb. 4, 2020, 7:01 AM), <https://www.wsj.com/articles/its-all-smiles-at-sony-as-smartphone-cameras-boost-demand-for-its-image-sensors-11580817679> [<https://perma.cc/FS57-DQHQ>].

166. See *Loom Co. v. Higgins*, 105 U.S. 580 (1881) (explaining that patented improvements to looms for weaving fabric took approximately ten years to develop).

167. See *GE Co. v. Wabash Appliance Co.*, 304 U.S. 364, 371 (1938) (“the claim uses indeterminate adjectives which describe the function of the grains to the exclusion of any structural definition.”); *United Carbon Co. v. Binney & Smith Co.* 317 U.S. 228, 234 (1942) (“the claims are but inaccurate suggestions of the functions of the product and fall afoul of the rule that a patentee may not broaden his claims by describing the product in terms of function.”). Cases concerning functional language have been a recurrent theme. However, it later mainly a question of claim construction. For example, with regards to drafting claims in a means-plus-function claim format. Judge Rich, one of the drafters of the Patent Act of 1952 stated that “if you adopt this practice [of claim drafting], that element or step is construed – shall be construed (it is mandatory) – to cover the corresponding structure, material or acts described in the specification and equivalents thereof.” See also *Pennwalt Corp. v. Durand-Wayland, Inc.* 833 F.2d 931, 934 (Fed. Cir. 1987) (*en banc*).

reasonable certainty of claims directed to carbon black are not the equivalent of those directed to the conversion of waste coal into green biofuels.¹⁶⁸ Comparing disclosures reflects an entirely different patent drafting challenge. As a result, *Nautilus* is increasingly impractical as the industry pushes deeper into the 4IR.

B. Claim Construction and Definiteness

Under *Exxon*, definiteness was self-evident once the claims were construed pursuant to the modern tenants of claim construction. *Nautilus* inherently isolated definiteness and claim construction. Yet, the Supreme Court failed to affirmatively set out how the two interrelate. In other words, it is unclear where claim construction ends, the definiteness inquiry begins, and the evidentiary interplay of the two doctrines. As discussed above, the trial court in *Exxon* found the claims indefinite prior to, and hence independent of, claim construction.

Even if a district court adopts the often-used approach of procedurally pairing indefiniteness with claim construction, there are still open substantive questions as to the interplay of the doctrines.¹⁶⁹ For example, consider a case where the judge is assessing a claim construction that varies significantly from the parties' proposed constructions. How does that impact the judge's assessment of indefiniteness, if at all?¹⁷⁰ When the claims are ambiguous and extrinsic evidence constitute substantive evidence on all issues relevant to claim scope, the demarcation between claim construction and definiteness inquiries is less clear. The high reversal rate of claim construction decisions¹⁷¹

168. See, e.g., Methods and Systems for Biological Coal-to-Biofuels and Bioproducts, U.S. Patent No. 10,557,155 B2 (issued Feb. 11, 2020).

169. See *Phillips v. AWS Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) ("It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.' . . . That principle has been recognized since at least 1836, when Congress first required that the specification include a portion in which the inventor 'shall particularly specify and point out the part, improvement, or combination, which he claims as his own invention or discovery.' In the following years, the Supreme Court made clear that the claims are 'of primary importance, in the effort to ascertain precisely what it is that is patented.'" (citation omitted)).

170. Federal Circuit precedent reflects an orderly procedural approach. First, the claims are construed. Second, indefiniteness is evaluated. However, issues such as how to the standards of appeal review or linking testimony of skilled artisans on extrinsic evidence and overlapping issues of claim scope are not clearly charted.

171. See, e.g., Kimberly A. Moore, *Markman Eight Years Later: Is Claim Construction More Predictable?*, 9 LEWIS & CLARK L. REV. 231, 239 (2005). Prior to

may compound the issue. For example, it is possible that on appeal, the record on definiteness was intertwined with an errant claim construction.¹⁷²

C. *Extrinsic Evidence*

Another problem is the nexus between claim construction and definiteness. For example, for purposes of claim construction, there are seminal cases that limit the role of extrinsic evidence, such as *Markman*, *Cybor*, and *Phillips*. These cases pre-date *Nautilus*. The *en banc* Federal Circuit in *Phillips* recited four reasons why district courts should use sound discretion concerning the use of extrinsic evidence.¹⁷³ First, extrinsic evidence is not part of the patent and may not be co-extensive with the intrinsic record for purposes of assessing the patent's scope. Second, extrinsic publications may not reflect the understanding of those of skill in the art in the patented subject matter. Third, extrinsic evidence in the form of expert testimony is generated at the time of and for the purposes of litigation. Thus, it may suffer from bias or otherwise not be consistent with the intrinsic record. Fourth, given the wealth of extrinsic evidence having marginal relevance to patented subject matter, litigants are likely to weave together pieces of extrinsic evidence to support its arguments. The Federal Circuit in *Phillips* expressly stated that extrinsic evidence for purposes of determining claim scope is "unlikely to result in a reliable interpretation of patent scope."¹⁷⁴ Yet, the Supreme Court in *Nautilus* was silent

appointment to the bench, Judge Moore noted that from 1996 through 2003, the Federal Circuit reversed thirty-four percent of the claim constructions it reviewed. This statistic should be weighed considering the average rate of reversals in civil cases in Federal Courts which averaged roughly 12 percent at that time. See *Table 3.1—U.S. Court of Appeals for the Federal Circuit Judicial Facts and Figures*, U.S. CTS., (Sept. 30, 2005), <https://www.uscourts.gov/statistics/table/31/judicial-facts-and-figures/2005/09/30> [<https://perma.cc/UV8T-988J>].

172. See *Haemonetics Corp. v. Baxter Healthcare Corp.*, 607 F.3d 776, 784 (Fed. Cir. 2010) (explaining that the decision on definiteness was remanded for further proceedings because the record below was based on an errant claim construction. In *Teva Pharmaceuticals USA, Inc. v. Sandoz, Inc.*, the Federal Circuit reversed the district court's holding on definiteness. 789 F.3d 1335, (Fed. Cir. 2015). As the dissent pointed out, because the "insolubly ambiguous" test was good law at the time of the district court's determination, the majority should have remanded the case for further proceedings to establish a record on definiteness. *Id.* at 1349. Because applying the "insolubly ambiguous" standard, there could not possibly be evidence, and thus adequate briefing, on definiteness. *Id.*

173. *Phillips*, 415 F.3d at 1318.

174. *Id.* at 1319.

on how this same evidence should be used for purposes of assessing definiteness. For example, articles prohibited for purposes of claim construction might be cobbled together for purposes of supporting definiteness.

The most glaring issue relates to the experts. For claim construction, the concept of expert assistance can trace its history to at least as early as 1895.¹⁷⁵ The expert acted in the capacity of an *amicus*. The role of expert testimony, *i.e.*, testimony of the skilled artisan, as it relates to claim construction was qualified by the Supreme Court in *Markman*:

The decisionmaker vested with the task of construing the patent is in the better position to ascertain whether an expert's proposed definition fully comports with the specification and claims and so will preserve the patent's internal coherence. We accordingly think there is sufficient reason to treat construction of terms of art like many other responsibilities that we cede to a judge in the normal course of trial, notwithstanding its evidentiary underpinnings.¹⁷⁶

Almost a decade later, the *en banc* Federal Circuit in *Phillips* noted that "the inquiry into how a person of ordinary skill in the art understands a claim term provides an objective baseline from which to begin claim interpretation."¹⁷⁷ On the use of expert testimony, the Federal Circuit warned that "expert reports and testimony is generated at the time of and for the purpose of litigation and thus can suffer from bias that is not present in the intrinsic record."¹⁷⁸

In 1894, Justice Brewer authored an article in which he raised several concerns regarding patent litigation.¹⁷⁹ One was the use of experts. He noted:

175. See *Markman v. Westview Instruments*, 517 U.S. 370, 387 (1996) (quoting A. Walker, *Patent Laws* § 75, p. 68 (3d ed. 1895). Prophetically, Walker noted that "[q]uestions of construction are questions of law for the judge, not questions of fact for the jury. As it cannot be expected, however, that judges will always possess the requisite knowledge of the meaning of the terms of art or science used in letters patent, it often becomes necessary that they should avail themselves of the light furnished by experts relevant to the significance of such words and phrases. The judges are not, however, obliged to blindly follow such testimony.").

176. *Markman*, 517 U.S. at 390 (1996).

177. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (*en banc*).

178. *Id.* at 1318.

179. D. J. Brewer, *The Patent System*, 3 YALE L.J. 149, 155–56 (1894). It is remarkable, if not troubling, that many of Justice Brewer's concerns from the nineteenth century exist in the U.S. patent system today.

Every lawyer interviews, as he ought, his witnesses, that he may have to interview many before he finds [one] with the skill of an expert who looks upon the relations of things in a light favorable to his case, and that so you read the testimony of the patent expert on one side that there is patentability and infringement, of the one on the other side that there is neither.¹⁸⁰

Justice Brewer also attributed the following quote to Justice Miller: “You don’t expect me to pay much attention to the testimony of witnesses who swear for either side at \$50 a day?”¹⁸¹

The Supreme Court expressed the need to avoid “zones of uncertainty” on claim construction (*Markman*) and subsequently on definiteness (*Nautilus*).¹⁸² Yet, the expert is an *amicus* for claim construction but afforded substantive weight for definiteness. The attempt to compartmentalize the same testimony bearing two different issues creates “zone[s] of uncertainty.”¹⁸³

D. *Obfuscation Compounded: Teva Pharmaceuticals*

One year after *Nautilus*, the Supreme Court handed down *Teva Pharmaceuticals*.¹⁸⁴ Below, the district court construed the claim term “molecular weight of 5 to 9 kilodalton.”¹⁸⁵ The intrinsic record

180. *Id.* This selection process may skew assumptions underlying reasonable certainty, *e.g.*, in an instance where there exists a disproportionate number of skilled artisans who embrace a particular opinion regarding definiteness.

181. *Id.* The Bureau of Labor Statistics only goes back to 1913. According to unofficial consumer price index calculators, Justice Miller’s biased expert in or around 1890 would cost roughly \$1,422 a day in 2020. CPI INFLATION CALCULATOR <https://www.officialdata.org/us/inflation/1890?endYear=2020&amount=50> [<https://perma.cc/E3DG-ZRD9>].

182. *Markman v. Westview Instruments, Inc.*, 517 U.S. 370 (1996); *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898 (2014).

183. Justice Brewer noted that experts can provide the judge with helpful information and most have good character and “complete scientific knowledge.” D. J. Brewer, *The Patent System*, 3 YALE L.J. 149, 155–56 (1894). The Federal Circuit also noted that experts can simplify the complexity of technological subject matter, explain the relevance of the technological subject matter, and provide useful testimony about the accused product and prior art. *See, e.g., Philips*, 415 F.3d at 1318; *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1308–09 (Fed. Cir. 1999). In 4IR, the patent community will be well-served by more routine use of neutral technical advisors.

184. *See Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 574 U.S. 318 (2014). The anticipated impact of *Nautilus* on claim construction is explored in Jason Rantanen, *Teva, Nautilus, and Change Without Change*, 18 STAN. TECH. L. REVIEW 430, 538 (2015).

185. *Teva Pharms. USA, Inc. v. Sandoz Inc.*, 810 F. Supp. 578, 596 (S.D.N.Y.

included support for three interpretations. The extrinsic record included testimony from two experts having divergent views. The district court's claim construction and definiteness determinations included findings of fact on the extrinsic evidence.

The district court construed the claims and, relying on *Exxon*, held that the claims were definite.¹⁸⁶ On appeal, the Federal Circuit afforded no deference to the district court's factual findings on claim construction, namely, those stemming from the testimony of the patentee's expert.¹⁸⁷ As the court reversed *Exxon* during the pendency of the appeal, the Federal Circuit applied the "reasonable certainty" standard definiteness of *Nautilus* and held that the claim limitation "molecular weight of 5 to 9 kilodalton" was indefinite.¹⁸⁸ The Supreme Court granted the writ of *certiorari*. The focus of the Supreme Court's decision was the Federal Circuit's failure to give deference to the district court's factual findings on claim construction.¹⁸⁹ The Supreme Court reversed the Federal Circuit's long-standing and controversial precedent¹⁹⁰ that claim construction was purely a question of law.

On remand, the Federal Circuit tersely recited four findings of fact concerning extrinsic evidence on claim construction. It found no clear error and accordingly affirmed the district court's claim construction. In the same paragraph, the Federal Circuit inherently ignored the findings of fact for purposes of applying *Nautilus*. The Federal Circuit reversed the district court's holding of definiteness. In his dissent, Judge Mayer pointed out that there were no factual findings on definiteness

2011) The patents-in-suit are directed to a manufacturing method for Copaxone, a drug for treating multiple sclerosis.

186. *Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 876 F. Supp 2d 295, 401 (S.D.N.Y. 2012).

187. *Teva Pharms.*, 789 F.3d at 1339.

188. *Id.*

189. *See Teva Pharms.*, 574 U.S. at 323; *Lighting Ballast Control LLC v. Philips Elecs. N. Am. Corp.*, 744 F.3d 1272, 1306 (Fed. Cir. 2014) (en banc) (the dissent from the majority stated that "it is hard to understand how either the majority in *Cybor* or the majority here can dispute that claim construction sometimes requires a district court to resolve contested factual issues.").

190. The dissent in *Lighting Ballast Control LLC v. Philips Electronics North America*, noted that "the majority of intellectual property lawyers and academics around the country will no doubt be surprised by today's majority opinion – and for good reason." It added that "[c]riticism of and debate over *Cybor* have been widespread since it issued – not only among legal scholars and patent practitioners, but also among members of this court." 744 F.3d at 1296.

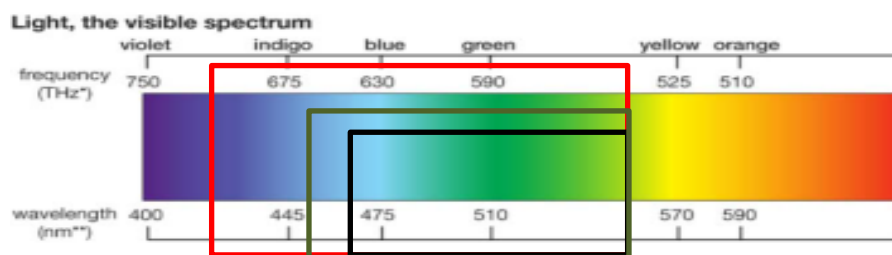
or corresponding briefing.¹⁹¹ It highlights the conflict. Given the ruling in *Teva Pharmaceuticals*, the district court's factual findings on definiteness should be afforded deference under Federal Rules of Civil Procedure 52.

E. *Practical Problems of Nautilus and Teva*

Consider a simple, hypothetical patent directed to a novel visible light emitter that includes the claim limitation "blue-green hue." For green light, the dominant wavelength¹⁹² is widely accepted as 550 nm. In the hypothetical patent, the intrinsic record unequivocally discloses an upper wavelength cutoff for "blue-green hue" corresponding with the dominant wavelength of 550 nm. In contrast, the hypothetical intrinsic record bearing on the lower wavelength cutoff is ambiguous. There is intrinsic support for wavelength cutoffs of 420 nm, 450 nm, or 465 nm. The "dominant" wavelength for blue light is 450 nm. The term "dominant wavelength" is not part of the intrinsic record, thereby creating ambiguity. Hence, resort to extrinsic evidence is not barred by applicable precedent on claim construction.

191. See *Teva Pharms.*, 574 U.S. at 1345–49 (Mayer, J., dissenting). The district court applied the *Exxon* standard which entirely turns on claim construction. Given that "insolubly ambiguous" standard was overruled during the pendency of appeal, Judge Mayer correctly reasoned that the case should be remanded for further proceedings on definiteness. In other words, the Federal Circuit applied extrinsic evidence for claim construction, ignored extrinsic evidence in evaluating definiteness. *North American Vaccine*, which pre-dated *Exxon*, likewise, highlights this tension. The Federal Circuit excluded extrinsic evidence on claim construction as unreliable. It then relied on extrinsic evidence for deciding definiteness. *N. Am. Vaccine, Inc. v. Am. Cyanamid Co.*, 7 F.3d 1571, 1580 (5th Cir. 1993) ("[A]s a scientist, I would look at the structure of the polysaccharides from those types and I would say are they structures that would, when subjected to this process, leave a backbone that's antigenic and probably, therefore, effective as a vaccine.") (emphasis added). In sum, the *de novo* standard for definiteness makes little sense given the Supreme Court's decision in *Teva Pharmaceuticals*.

192. The determination of "dominant wavelength" is well-known. See, e.g., LIQUID CRYSTALS APPLICATIONS AND USES, VOL. 2 51–53 (Birendra Bahadur ed., 1991); HANDBOOK OF HUMAN-COMPUTER INTERACTION 583–84 (Martin G. Helander et al. eds., 2nd ed. 1997).



Assume Competitor Inc. seeks to assess the white space outside the claims. Given the ambiguity in the lower frequency cutoff, the figure above represents three possible constructions of “blue-green hue.” Under *Exxon*, the decision-makers at Competitor Inc. can rest assured that the claims are definite: the claims can be construed. Similarly, they can reasonably anticipate a narrow construction, “visible light having a wavelength from 465 nm to 550 nm.” The black rectangle above more likely than not “circumscribe[s] what is foreclosed from future enterprise”¹⁹³

Under *Nautilus* considering *Teva*, however, the analysis for purposes of white space is unclear. Pursuant to *Teva*, one or more skilled artisans can be tasked with finding, reviewing, and relying on extrinsic evidence for purposes of assessing white space. If those of skill in the art agree on one possible construction, the corporate decision-makers can rest assured as to claim scope. If there is divergence amongst the skilled artisans, which is more likely than not, the decision-makers as educated laypersons must rule out proposed constructions based on factual underpinnings that they deem “clearly erroneous.” There may be divergence amongst the decision-makers. Certainty is far less than optimal.

Whether or not those involved agree on white space, Competitor Inc. would be well-served in assessing definiteness. *Nautilus* sanctions the use of extrinsic evidence on the issue of definiteness. The skilled artisans are not bound to those used during claim construction. Assuming there is divergence in their findings, the decision-makers, the skilled artisans, or perhaps both, must vote. Most of the votes answer the legal question of definiteness. While turning to democracy on definiteness sounds odd, the methodology is not random. Definiteness

193. *United Carbon Co. v. Binney & Smith Co.*, 317 U.S. 228, 236–37 (1942).

remains a question of law and will be reviewed *de novo* on appeal. The majority of any given panel resolves the issue.

VII. STATISTICAL IMPACT OF *NAUTILUS*¹⁹⁴

In 2015, a Federal Circuit panel confirmed that “there can be no serious question that *Nautilus* changed the law of definiteness.”¹⁹⁵ Six years later, there is a reasonable data set to evaluate the impact of that change. Eliminating 2014,¹⁹⁶ which was the year *Nautilus* was handed down, definiteness challenges from 2008¹⁹⁷ through 2020 were tallied. Not surprisingly, definiteness challenges in the trial courts¹⁹⁸

194. The numbers presented in this Section were tabulated as an approximation. Precision is impracticable, perhaps not even useful, due to extraneous factors such as unreported decisions, supplemental briefing, related claims and patent specifications, subsequent history, litigation tactics such as “kitchen sink” challenges, etc. Indefiniteness cases arising from syntax-related fact patterns were excluded, such as mixed apparatus and method claims. *See, e.g.*, *WMS Gaming Inc. v. Int’l Game Tech.*, 184 F.3d 1339 (Fed. Cir. 1999) (functional claims for software algorithms); *IPXL Holdings, LLC v. Amazon.com, Inc.*, 430 F.3d 1377 (Fed. Cir. 2005) (mixed apparatus and method claims). Indefiniteness statistics from the patent office were also excluded as the PTO applies a different standard for claim scope, i.e., the Broadest Reasonable Interpretation (“BRI”). *See, Ex parte McAward*, No. 2015-006416, 2017 WL 3669566 (P.T.A.B. Aug. 25, 2017) (precedential opinion holding that in *ex partes* prosecution, the BRI standard renders *Nautilus* inapplicable). There are also no contrary indications that the BRI standard will be utilized in *inter partes* review (“IPR”) proceedings in the Patent Office); *See cf.* *Tinnus Enters., LLC v. Telebrands Corp.*, 733 F. App’x 1011 (Fed. Cir. 2018) (“We, thus await an appropriate case to resolve any apparent inconsistencies between the two indefiniteness standards . . .”). Further, definiteness issues before the PTAB are not a basis for granting IPR petitions and are currently limited only to evaluating allowance of new or amended claims as well.

195. *Dow Chem. v. Nova Chems. Corp.*, 803 F.3d 620, 630 (Fed. Cir. 2015).

196. It is difficult to determine how litigants and courts responded to *Nautilus* following the decision. For example, *Nautilus* may not have been applied where discovery has closed, trials were complete, motions, etc. Moreover, it is reasonable to assume that the decision was not fully understood by litigants and courts.

197. The year 2008 was selected as the cutoff to provide a set of cases that are generally include comparable precedent on claim construction.

198. “Trial Courts” include U.S. district courts, The Court of Federal Claims, and the International Trade Commission (“ITC”).

increased by 253%.¹⁹⁹ Appeals²⁰⁰ of definiteness determinations increased by 95%.²⁰¹ Despite the increases, the change in invalidity rates pre-*Nautilus* versus post-*Nautilus* was not dramatic.²⁰² At the trial court level, the pre-*Nautilus* invalidity rate was 32.6%, while the post-*Nautilus* invalidity rate was 32.5%. There was a larger variance on appeal. The pre-*Nautilus* invalidity rate was 20% versus the post-*Nautilus* rate of 36.4%.

Although the invalidity rate in trial courts has not changed appreciably, there are additional considerations. First, there is a case to be

199. The following charts reflect *Nautilus* challenges from 2008 through 2020:

Court	2008	2009	2010	2011	2012	2013	2014	Total
District Court	7	9	6	2	11	7	—	42
ITC	0	0	0	0	1	0	—	1
Federal Circuit	4	4	5	3	1	3	—	20

Court	2014	2015	2016	2017	2018	2019	2020	Total
District Court	—	17	5	2	7	47	64	142
ITC	—	1	0	1	1	4	5	12
Federal Circuit		8	6	9	66	4	7	39

200. “Appeals” only include those from “Trial Courts,” *i.e.*, not the Patent and Trademark Office.

201. *See supra* note 200 (chart).

202. Prior statistical pre-*Nautilus* studies are sparsely available. On appeal before the Federal Circuit covering December 1998 through to December 2008, there seems to be pre-*Nautilus* correlation, namely a 33 percent invalidity rate. *See* Christa Laser, *A Definite Claim on Claim Indefiniteness: An Empirical Study of Definiteness Cases of the Past Decade with a Focus on the Federal Circuit and the Insolubly Ambiguous Standard*, 10 CHI.-KENT J. INTEL. PROP. 25, 31 (2010). However, at the trial court level, in a different article the authors examined indefiniteness cases from 1982 to 2012. *See* John R. Allison & Lisa Larrimore Ouellette, *How Courts Adjudicate Patent Definiteness and Disclosure*, 65 DUKE L.J. 609, 612 (2016). The article reflects a robust, detailed study of the statistics associated with Section 112 of the Patent Act. The reported invalidity rate associated with indefiniteness reflects a large variance from that reported here, namely an invalidity rate of 18.2 percent. *Id.* at 645. The differences may be attributable variances associated changes over time, such as intervening precedent or reporting sources, etc. A broader dataset for definiteness issues was also included, such that associated with mixed claiming.

made that, given the increase in challenges, the rate should have dropped.²⁰³ Consider other changes relating to patent invalidity, such as *Alice Corp.*²⁰⁴ or the introduction of *inter partes* review (“IPR”). In both instances, “success rates” dropped significantly as the number of challenges increased. One year after the Supreme Court handed down *Alice*, the invalidity rate was 69.7% in district courts and 94.1% at the Federal Circuit.²⁰⁵ At the five-year mark, the cumulative invalidity rate dropped to 53.7% in district courts and 76.3% at the Federal Circuit. A similar observation can be made regarding IPR institution rates. After one year, the number of IPR institutions was 74.2%.²⁰⁶ After six years, the cumulative institution rate dropped to 63%.²⁰⁷ Based on these observations, one could expect the success rates of *Nautilus* challenges to drop, especially given the sizeable increase in challenges. That has not happened.

In most patent cases, the patents-in-suit lag innovation by several years or more. Hence, as 4IR technology and convergent patents are more frequently issued and litigated, the overall number of patents invalidated could increase with time, at least until the patent community responds with more robust patent applications.

203. Aside from the higher bar associated with the definiteness standard, under *Exxon* the patent challenger faced an advocacy dilemma. An accused infringer could proffer a claim construction on a potentially indefinite claim. Alternately, the patent challenged could forgo a proposed construction in favor of arguing that the claim is incapable of being construed. To be clear, *Exxon* did not bar the possibility of doing both as alternative arguments. In some cases where the construction was confusing, the claims may not have escaped the “ambiguously insoluble” standard. See *Star Scientific, Inc. v. R. J. Reynolds Tobacco Co.*, 537 F.3d 1357, 1371 (Fed. Cir. 2008). (“In and of itself, a reduction of the meaning of a claim term into words is not dispositive of whether the term is definite.”) However, presenting defenses in the alternative often undermines credibility as to both defenses. This is humorously highlighted by Bart Simpson’s classic defense; “I didn’t do it, no one saw me do it, you can’t prove anything.”

204. *Alice Corp. v. CLS Bank Int’l*, 573 U.S. 208, 212 (2014). In *Alice Corp.*, the Supreme Court increased the patentability standard pursuant to 35 U.S.C. §101 for computer-implemented inventions. Two years earlier, the Supreme Court did the same for inventions directed to biotechnology. *Mayo Collaborative Servs. v. Prometheus Labs., Inc.* 566 U.S. 66, 72 (2012).

205. See Jasper L. Tran & J. Sean Benevento, *Alice at Five*, 2019 PATENTLY-O PAT. L. J. 25, 27–29.

206. U.S. PAT. AND TRADEMARK OFF., PATENT TRIAL AND APPEAL BOARD STATISTICS 7 (2015).

207. U.S. PAT. AND TRADEMARK OFF., TRIAL STATISTICS IPR, PGR, CBM (2017); U.S. PAT. AND TRADEMARK OFF., PTAB TRIAL STATISTICS JANUARY 2021 IPR, PGR, CBM (2021).

A. Definiteness by Category

Nautilus involved a claim term having a term of degree, *i.e.*, “spaced relationship.” The general claim categories for purposes of definiteness generally include terms of degree, subjective terms, measurement, and lack of antecedent basis. Breaking down definiteness by categories²⁰⁸ offers insight into better claiming strategies.

Pre-*Nautilus* Results in Trial Courts by Category²⁰⁹

Category	Terms of Degree	Measurement	Subjective Terms	Antecedent Basis
Indefinite	19	1	19	9
Definite	38	9	27	26
TOTAL	57	10	46	35
				TOTAL 148

Post-*Nautilus* Results on Appeal by Category²¹⁰

Category	Terms of Degree	Measurement	Subjective Terms	Antecedent Basis
Indefinite	3	4	4	1
Definite	13	2	3	0
TOTAL	16	6	7	1
				TOTAL 33

Post-*Nautilus* trial court findings by category yield some general observations. Subjective terms and terms of degree were most frequently challenged. Subjective terms reflect the highest invalidity rate at 41.3%. Terms of degree are a close second with an invalidity rate of 32.8%. These observations are not surprising given the fact that

208. The distinction between the four categories is highly fact dependent. Hence, the demarcation between categories can often be a judgment call. For example, some might categorize “spaced relationship” as a subjective term. For that reason, the observations in this section cannot be definitive.

209. Twelve cases involve claim language and fact patterns that did not readily lend themselves to the four categories and were excluded from consideration.

210. See U.S. PAT. AND TRADEMARK OFF., *supra* note 207.

skilled artisans have greater latitude for divergent opinions in these categories.

Terms of degree are most frequently challenged on appeal but have the lowest rate of invalidity at 18.8%. Antecedent basis is least likely to be challenged on appeal. This may reflect the fact that the Federal Circuit has exclusive jurisdiction over appeals from the patent office and, as a result, tremendous experience concerning claim drafting defects, such as antecedent basis. Eliminating antecedent basis due to the infrequent number of appeals, neither measurement nor subjective terms fair well on appeal, as reflected by an invalidity rate of 66.7% and 57.1%.

VIII. PATENT CLAIMS AND BRIGHT STARS²¹¹

The fact patterns of the successful and unsuccessful post-*Nautilus* by category²¹² is not conclusive but may offer insights for purposes of claim drafting and evaluating white space.

A. *Terms of Degree*²¹³

Comparison of *Sonix Technology Co. v. Publications International, Ltd.*²¹⁴ and *Intellectual Ventures I LLC v. T-Mobile USA, Inc.*²¹⁵ illustrates that the terms of degree are not *per se* indefinite. Rather, these two data points suggest that definiteness turns on clarification of subjective claim terms. In *Sonix Technology*, the Federal Circuit noted that the written description taught those of skill in the art how to construct measurement equipment that quantifies a term of degree.²¹⁶ By way of contrast, in *Intellectual Ventures I*, the patent in suit contained

211. Definiteness associated with means plus function claims/algorithms and mixed method/apparatus claims have been excluded. These categories relate to a different line of precedent. Indefiniteness associated with use of means plus function claims directed to algorithms are subject to *Williamson v. Citrix Online, LLC*, 792 F.3d 1339 (Fed. Cir. 2015) and its progeny. Indefiniteness stemming from mixed apparatus and method claims are subject to *IPLX Holdings, LLC v. Amazon.com, Inc.*, 430 F.3d 1377, 1384 (Fed. Cir. 2005) and its progeny.

212. *See supra* Part IV.

213. The lines differentiating “terms of degree” and “subjective terms” are on occasion unclear. The authors have attempted to define “terms of degree” when presented with a range of values.

214. 844 F. 3d 1370, 1377 (Fed. Cir. 2017).

215. 902 F.3d 1372, 1381 (Fed. Cir. 2018).

216. 844 F.3d at 1378.

the claim terms “QoS requirements” and “optimiz[ing] . . . QoS.”²¹⁷ The specification of the patent indicates the term is bounded by the end-user’s experience.²¹⁸ The hypothetical end-user provides no quantification and runs afoul of *Nautilus*.

B. Subjective Terms

Comparing *DDR Holdings, LLC v. Hotels.com, L.P.*²¹⁹ and *Interval Licensing LLC v. AOL, Inc.*²²⁰ illustrates that subjective patent claims may be definite. Providing examples of noninterfering structures and the procedures for determining what is covered by the subjective terms is helpful.²²¹ However, the definiteness requirement is not satisfied by subjective terms that are unclear, unbounded, or that have hazy relationships with the specification. For reaching the reasonable certainty milestone, subjective terms should be anything but plainly subjective.

C. Terms of Measurement

The definiteness requirement for terms involving measurement requires some quantification. *Warsaw Orthopedic, Inc. v. NuVasive, Inc.*²²² illustrates this point. There the patent in question claimed a spinal fusion implant that transverses the width of the patients’ vertebrae.²²³ The Federal Circuit indicated that the relative nature does not render the claim limitation indefinite. In upholding the validity of the

217. U.S. Patent No. 6,640,248; See *Intell. Ventures I, LLC v. T-Mobile USA, Inc.*, 902 F.3d 1372, 1381 (Fed. Cir. 2018).

218. ’248 Patent.

219. 773 F.3d 1245 (Fed. Cir. 2014). In *DDR Holdings*, the patents-in-suit related to systems and methods of generating a composite webpage and included the claim limitations “visually perceptible elements” and “look and feel” relating to a composite webpage. The Federal Circuit indicated that the specification described “look and feel” elements as “includ[ing] logos, colors, pages layout, navigation systems, frames, ‘mouse-over’ effects, or other elements that are consistent through some or all a Host’s website.” Extrinsic evidence indicated that one of skill in the art would interpret “other elements” as headers, footers, fonts, and images.” The Federal Circuit also pointed to the patentee’s own advertisements to support these limitations.

220. 766 F.3d 1364, 1373 (Fed. Cir. 2014).

221. *Enzo Biochem, Inc. v. Applera Corp.*, 599 F.3d 1325, 1334–35 (Fed. Cir. 2010). (a skilled artisan could review multiple examples in the intrinsic record to determine whether a particular chemical bond would “interfer[e] substantially” with hybridization).

222. 778 F.3d 1365, 1370–71 (Fed. Cir. 2015).

223. U.S. Patent No. 5,860,973 (filed Oct. 30, 1996) (issued Jan. 19, 1999).

patent, the Federal Circuit reasoned that the variances are reasonably well-known.²²⁴ In contrast, the Federal Circuit in *Teva Pharmaceuticals USA, Inc. v. Sandoz, Inc.*²²⁵ held that the intrinsic record supported three different measurements for the claim term “molecular weight of about 5 to 9 kilodaltons.”²²⁶ The Federal Circuit held that the skilled artisan would be unable with reasonable certainty to ascertain the scope of the claim.

D. Lack of Antecedent Basis

There was only one Federal Circuit decision concerning lack of antecedent basis. However, the district court case, *RetailMeNot, Inc. v. Honey Science Corp.*,²²⁷ may be helpful. The claim elements of the patent-in-suit,²²⁸ “the list” and “server,” both expressly lacked antecedent basis. However, amendments made during the prosecution history equated “the list” with “digital codes,” which was recited in the claims. The magistrate reasoned that “digital codes” are the antecedent basis. In contrast, the limitation “server” could have related to numerous servers. Hence, the magistrate found that it was lacking antecedent basis. Her reasoning on “the list” supports the view that reasonable certainty for antecedent basis is flexible.²²⁹

IX. CONCLUSION

Computerized research, artificial intelligence, ICT, and the IoT are spewing highly complex and convergent technologies at a mindboggling pace.²³⁰ Corporate leaders know that success, or failure, hinges on the time to market. In the meantime, large technology companies

224. It is noteworthy that the parties stipulated that the average dimensions of the human vertebrae are well-documented by extrinsic evidence. *Warsaw Orthopedic*, 778 F.3d at 1371.

225. 789 F.3d 1335, 1338 (Fed. Cir. 2015).

226. U.S. Patent No. 5,800,808 (filed May 22, 1995) (issued Sept. 1, 1998).

227. C.A. No. 18-937-CFC-MPT, 2019 U.S. Dist. LEXIS 205723, at *49 (D. Del. Nov. 27, 2019).

228. U.S. Patent No. 10,140,625 (filed Nov. 28, 2017) (issued Nov. 27, 2018).

229. *RetailMeNot*, 2019 U.S. Dist. LEXIS 205723. The case settled prior to review of her recommendations. Nonetheless, there is nothing in *Nautilus* to suggest that her analysis and reasoning was faulty.

230. *Gearing up for the Fourth Industrial Revolution*, EPO, <https://www.epo.org/about-us/annual-reports-statistics/annual-report/2017/highlights/4th-industrial-revolution.html> [http://perma.cc/G5TW-29E2].

are continuing to weaken the patent system.²³¹ This raises the question of whether *Nautilus* has become another detractor like *Alice* or IPRs. Post-*Nautilus* numbers suggest that definiteness is not a major concern. Yet, there is cause for concern. Courts are now presiding over patents that were prepared and prosecuted squarely in the 4IR. The number of definiteness challenges in court are rapidly increasing. As a result, and because the invalidity rate has not trended downward, courts are invalidating a higher number of patents. After a thorough examination of the issue, there are two observations. First, an *Exxon*-like test makes more sense given the close relationship between claim construction and definiteness. Second, the standard of appellate review for definiteness needs to be harmonized with *Teva Pharmaceuticals*. Lack of certainty favors infringers, not patentees. It is unlikely that either will happen soon or perhaps ever.

Regardless of “bright stars” or “unreliable compasses,” the patent community will be well-served by recognizing the value associated with implementing best practices to satisfy the definiteness requirement in the 4IR. For the foreseeable future, the permissible scope of patents during this unprecedented time will be governed by a statutory framework that has remained unchanged since 1870.

231. See *Impression Prods., Inc. v. Lexmark Int'l, Inc.* 137 S.Ct. 1523 (2017).