

ARTICLES

PATENT CLAIM INTERPRETATION AFTER *MARKMAN*: HOW THE FEDERAL CIRCUIT INTERPRETS CLAIMS*

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INTRODUCTION

The strength of a patent as an instrument of commercial power to protect an invention rests squarely on the drafting quality of its claims.¹ Under United States law, a patent's claims, not its accompanying "specification," define the metes and bounds² of the subject matter that a patentee can prevent others from making, using, importing, selling, or offering for sale.³ To wit, while a patentee need only disclose in his specification a single, best embodiment of his invention, he may be entitled to claim broadly his invention to encompass many more embodiments—and so ensnare a wider net of accused infringers—even if the patentee never explicitly disclosed how to make and use those other embodiments.⁴ The patentee's claim

1. See 37 C.F.R. §§ 1.71-77 (1997) (defining and explaining significance of requirements for patent application to U.S. Patent and Trademark Office ("USPTO")). The specification will include, *inter alia*, a title, background, a brief summary description, a detailed description, a claim or claims, an abstract of the disclosure, and necessary drawings of the invention or discovery. See *id.* § 1.77. Although technically part of the specification, the patent's claim(s) bear(s) the distinction of being the sole measure of the grant. See *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 365 U.S. 336, 339 (1961).

2. See *Zenith Labs., Inc. v. Bristol-Myers Squibb Co.*, 19 F.3d 1418, 1424, 30 U.S.P.Q.2d (BNA) 1285, 1290 (Fed. Cir. 1994) ("[T]he claim . . . sets the metes and bounds of the invention entitled to the protection of the patent system."); *In re Vamco Machine and Tool, Inc.*, 752 F.2d 1564, 1577 n.5, 224 U.S.P.Q. (BNA) 617, 625 n.5 (Fed. Cir. 1985) ("[C]laims are not technical descriptions of the disclosed inventions but are legal documents like the descriptions of lands by metes and bounds in a deed which *define the area* conveyed but *do not describe the land.*") (emphasis added).

3. See 35 U.S.C. § 154 (1994) (explaining ways in which patentee can enforce right to exclude others from infringement); see also *Autogiro Co. of Am. v. United States*, 384 F.2d 391, 395-96, 155 U.S.P.Q. (BNA) 697, 701 (Ct. Cl. 1967) (explaining heightened relevance of patent's claims over its specification).

4. See 37 C.F.R. § 1.71.

The specification must set forth the precise invention for which a patent is solicited, in such manner as to distinguish it from other inventions and from what is old. It must describe completely a *specific embodiment* of the process, machine, manufacture, composition of matter or improvement invented, and must explain the mode of operation or principle whenever applicable. The *best mode contemplated* by the inventor of carrying out his invention must be set forth.

may even be enforceable against later, improved embodiments that were unforeseen at the time the patentee filed his patent application.⁵ By contrast, a specification that provides detailed instructions on how to make and use even thousands of varieties of an invention cannot broaden a narrowly drafted claim that encompasses only a single one of these varieties.⁶

But claims are nothing more than strings of words, and the very nature of language can render words arguably ambiguous—even if not indefinite—and thus subject to contrary interpretations. The stakes for a particular interpretation are high for both the patentee and the accused infringer, because whether a product or process literally infringes a claim is often a corollary to a particular explication of a claim's meaning.⁷ Therefore, it is hardly surprising that a team of lawyers for the patentee will typically try to convince a court that one interpretation is correct, while another team of lawyers for the accused infringer will argue for a contrary construction. The Supreme Court's affirmance of the Federal Circuit's decision in *Markman v. Westview Instruments, Inc.*⁸ makes it unequivocal that the court, not the jury, must decide which side—if either—is right.⁹

Id. (emphasis added). For a case discussing the scope of description required in a patent specification relative to what may be legitimately claimed, see *Spectra-Physics, Inc. v. Coherent, Inc.*, 827 F.2d 1524, 1533, 3 U.S.P.Q.2d (BNA) 1737, 1745 (Fed. Cir. 1987) (stating that a patent "is not invalid for lack of enablement simply because it reads on another embodiment of the invention which is inadequately disclosed").

5. See *United States Steel Corp. v. Phillips Petroleum Co.*, 865 F.2d 1247, 1250, 1252, 9 U.S.P.Q.2d (BNA) 1461, 1463, 1465 (Fed. Cir. 1989) (holding that patent applicant need not predict every possible improvement or commercial embodiment of the invention, and that infringement will not be prevented by distinctions "directed solely to a later state of art").

6. See *Railroad Co. v. Mellon*, 104 U.S. 112, 118 (1881). The Court expressed the rule that "the scope of letters-patent should be limited to the invention covered by the claim, and that though the claim may be illustrated, it cannot be enlarged by the language used in other parts of the specification." *Id.*

7. An infringement analysis has two steps: first, the claim must be properly construed and, second, the claim must be compared to the allegedly infringing device. See *General Mills, Inc. v. Hunt-Wesson, Inc.*, 103 F.3d 978, 981, 41 U.S.P.Q.2d (BNA) 1440, 1442 (Fed. Cir. 1997) (citing *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976, 34 U.S.P.Q.2d (BNA) 1321, 1326 (Fed. Cir. 1995) (in banc), *aff'd*, 116 S. Ct. 1384 (1996)). "Literal infringement requires that every limitation of the patent claim be found in the accused infringing device." *Id.*, 41 U.S.P.Q.2d (BNA) at 1442 (citing *Read Corp. v. Protec, Inc.*, 970 F.2d 816, 821, 23 U.S.P.Q.2d (BNA) 1426, 1432 (Fed. Cir. 1992)). "The literal infringement determination, whether properly construed claims read onto an accused product or method, is a question of fact." *Id.* (citing *Charles Greiner & Co. v. Mari-Med Mfg.*, 962 F.2d 1031, 1034, 22 U.S.P.Q.2d (BNA) 1526, 1528 (Fed. Cir. 1992)). A finding of infringement is possible, however, absent a showing that every limitation of the patent claim is literally present in an accused infringing device, so long as an equivalent of every limitation can be shown to be present. See *infra* notes 30-33 and accompanying text (considering infringement under the doctrine of equivalents).

8. 116 S. Ct. 1384 (1996), *aff'g* 52 F.3d 967, 34 U.S.P.Q.2d (BNA) 1321 (Fed. Cir. 1995).

9. See *Markman v. Westview Instruments, Inc.*, 116 S. Ct. 1384, 1387 (1996) (holding that "the construction of a patent, including terms of art within its claim, is exclusively within the province of the court").

Were the issue of judge or jury the only effect of the *Markman* decision, litigators could still hope to mount battles of expert witnesses, honed to appeal to the sophistication of the bench rather than the populist sentiments of a jury, in order to convince the court of a particular claim interpretation. But *Markman* went the additional step of opining that expert opinion testimony "is entitled to no deference,"¹⁰ and that "the court has complete discretion to adopt the expert legal opinion as its own, to find guidance from it, or to ignore it entirely, or even to exclude it."¹¹

Moreover, in *Vitronics Corp. v. Conceptronic, Inc.*,¹² decided fifteen months after *Markman*, the Federal Circuit reiterated and further emphasized the centrality of intrinsic evidence—and the general marginality of extrinsic evidence in the form of expert opinion testimony—as sources for claim interpretation.¹³ While intimating that reliance by the district court on expert testimony in order to better understand the nature of the technology underlying a claimed invention may well be proper, the court stated that:

other expert testimony, whether it be of an attorney, a technical expert, or the inventor, on the *proper construction* of a disputed claim term . . . may only be relied upon if the patent documents, taken as a whole, are insufficient to enable the court to construe disputed claim terms. Such instances will rarely, if ever, occur.¹⁴

The policy behind this statement boils down to a matter of notice:

"Any other rule would be unfair to competitors who must be able to rely on the patent documents themselves, without consideration of expert opinion that then does not even exist, in ascertaining the scope of a patentee's right to exclude."¹⁵

10. *Markman*, 52 F.3d at 983, 34 U.S.P.Q.2d (BNA) at 1332.

11. *Id.*, 34 U.S.P.Q.2d (BNA) at 1333 (citing *Becton Dickinson & Co. v. C.R. Bard, Inc.*, 922 F.2d 792, 797, 17 U.S.P.Q.2d (BNA) 1097, 1100 (Fed. Cir. 1990)). Within the context of a patent infringement case, expert testimony is considered to be "extrinsic evidence," which is that evidence external to the patent and prosecution history. *See id.*, 34 U.S.P.Q.2d (BNA) at 1330. Extrinsic evidence includes expert and inventor testimony, dictionaries, and learned treatises. *See id.*, 34 U.S.P.Q.2d at 1330. "It is useful 'to show what was then old, to distinguish what was new, and to aid the court in the construction of the patent.'" *Id.*, 34 U.S.P.Q.2d (BNA) at 1330 (quoting *Brown v. Piper*, 91 U.S. 37, 41 (1875)). However, the intrinsic evidence of record should be considered first in construing patent claims. *See Hunt-Wesson*, 103 F.3d at 981, 41 U.S.P.Q.2d (BNA) at 1442 (citing *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582, 39 U.S.P.Q.2d (BNA) 1573, 1576 (Fed. Cir. 1996)); *Markman*, 52 F.3d at 979, 34 U.S.P.Q.2d (BNA) at 1329. Intrinsic evidence includes the patent's claims, specification, and prosecution history. *See Hunt-Wesson*, 103 F.3d at 981, 41 U.S.P.Q.2d (BNA) at 1442.

12. 90 F.3d 1576, 39 U.S.P.Q.2d (BNA) 1573 (Fed. Cir. 1996).

13. *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582-83, 39 U.S.P.Q.2d (BNA) 1573, 1576-77 (Fed. Cir. 1996).

14. *Id.* at 1585, 39 U.S.P.Q.2d (BNA) at 1579.

15. *Id.* at 1584, 34 U.S.P.Q.2d (BNA) at 1578 (quoting *Southwall Tech., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1578, 34 U.S.P.Q.2d (BNA) 1673, 1678-79 (Fed. Cir. 1995)).

The principle of notice as applied to claim construction is not a purely post-*Markman* development, however.¹⁶ Indeed, as demonstrated below, the use of intrinsic evidence by the Federal Circuit to construe claim terms has remained a long-standing, virtually ubiquitous exercise in the claim interpretation case law. But *Markman* and its progeny particularly emphasize the necessity—and often the sufficiency—of intrinsic evidence in disposing of claim interpretation issues. In light of *Markman* and its progeny, patent practitioners are now on heightened alert to take particular care in specification and claim drafting, and in the statements made to the Patent Office during prosecution,¹⁷ in order to reduce ambiguity as to the intended meaning of claim terms.¹⁸ Litigators are now also particularly apt to reorient their claim interpretation arguments in favor of intrinsic evidence to the extent possible. The dust has not yet settled, but in the minds of many, patent practice has been catapulted into new, uncharted territory.

Even in the post-*Markman* era, however, the Federal Circuit has found it necessary to consult extrinsic materials, such as dictionaries, in order to arrive at the “correct” interpretation of a claim term. Expert testimony, at least to the extent that it sheds light on relevant technology, has played a role as well. It would therefore be unduly limiting to view claim interpretation after *Markman* as an altogether brave new world, for while the Court’s rhetoric has signaled a paradigmatic shift in the way one looks at claims, the Court has not thrown out the baby with the bathwater. In short, the new era has

16. Indeed, notice has long undergirded the application of prosecution history estoppel. See *Hoganas AB v. Dresser Indus., Inc.*, 9 F.3d 948, 951, 28 U.S.P.Q.2d (BNA) 1936, 1939 (Fed. Cir. 1993) (stating that point of prosecution history estoppel is to prevent a patentee from claiming “subject matter” under his patent which was “relinquished during prosecution” through the doctrine of equivalents). A competitor should be able to discern what is covered by a patent from examination of the prosecution history. See *id.*, 28 U.S.P.Q.2d (BNA) at 1939. In fact, the “standard in determining what was relinquished is an objective one” based on what a competitor could reasonably conclude from the prosecution history. See *id.*, 28 U.S.P.Q.2d (BNA) at 1939.

[W]e conclude one of skill in the art . . . would not have been put on notice that the term meant other than what it says. . . . It would not be appropriate for us now to interpret the claim differently just to cure a drafting error That would unduly interfere with the function of claims in putting competitors on notice of the scope of the claimed invention.

Id., 28 U.S.P.Q.2d (BNA) at 1939.

17. See *infra* note 19 and accompanying text.

18. In light of the presumption of estoppel articulated in the Supreme Court’s recent decision in *Hilton Davis*, practitioners must also take care in giving reasons for amendments to claims so as to minimize the scope of prosecution history estoppel. See *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 117 S. Ct. 1040, 1049-51 (1997) (discussing infringement action asserting that competitor’s ultrafiltration method used to purify dye infringed patented method under doctrine of equivalents); see also *infra* note 31 and accompanying text (describing patent infringement under the doctrine of equivalents).

not rendered pre-*Markman* decisions altogether obsolete as a predictor of how the court will likely treat an intrinsic record in the future. Indeed, much can still be learned from how the court has treated intrinsic records in the past.

To this end, the purpose of this Article is to present case digests that illustrate how the Federal Circuit has gone about its business of claim interpretation—by primarily relying on intrinsic evidence—both before and after *Markman*. Anomalies are pointed out, and limitations on the use of extrinsic evidence are discussed. As will be seen, the Federal Circuit has not so much radically altered its manner of claim construction as it has renewed its focus on adequate public notice as perhaps the fundamental constraint on the claim interpretation process.

I. BACKGROUND

Before proceeding to a detailed analysis of the Federal Circuit's claim interpretation strategies, a few basic points warrant preliminary discussion.

First, before a patentee can even contemplate enforcing his patent against an accused infringer (and, in doing so, subjecting the patent's claims to interpretation by the courts), the patent's claims must first be examined and allowed by the United States Patent and Trademark Office ("USPTO"). This process is known as "patent prosecution."¹⁹ A basic inquiry during the course of examination is whether the language of the proposed claim is vague or indefinite,²⁰ or whether it reads on prior art.²¹

In making these inquiries, the USPTO engages in a claim interpretation process designed to minimize ambiguities in claim language²²

19. See UNITED STATES DEPARTMENT OF COMMERCE, PATENT AND TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE § 706 (6th ed. 1995) [hereinafter MPEP].

An application should not be allowed, unless and until issues pertinent to patentability have been raised and resolved in the course of examination, since otherwise the resultant patent would not justify the statutory presumption of validity (35 U.S.C. 282), nor would it "strictly adhere" to the requirements laid down by Congress in the 1952 Act as interpreted by the Supreme Court. The standard to be applied in all cases is the "preponderance of the evidence" test. In other words, an examiner should reject a claim if, in view of the prior art and evidence of record, it is more likely than not that the claim is unpatentable.

Id.

20. This inquiry is statutorily mandated by 35 U.S.C. § 112, second paragraph, which provides that claims must "particularly [point] out and distinctly [claim] the subject matter which the applicant regards as his invention." 35 U.S.C. § 112 (1994).

21. For example, if the claim is anticipated by prior art under 35 U.S.C. § 102, or rendered obvious under 35 U.S.C. § 103.

22. See MPEP, *supra* note 19, § 2171 (explaining that one of the essential purposes of examination is to determine whether or not claims are precise, clear, correct, and unambigu-

and to assess the applicability of prior art. An examiner's typically broad interpretation for purposes of examination is not necessarily the same as—and may in fact be quite different from—the interpretation that a court will accord a claim for the purpose of assessing infringement or claim validity. This Article focuses on the infringement/validity side of claim interpretation, not on the examination side.

Second, a claim may be considered ambiguous, and thus not in compliance with the definiteness requirements of 35 U.S.C. § 112, second paragraph, if it inferentially recites language that lacks *antecedent basis*.²³ For example, the claim language, "A chair comprising a back member, seat member, and vertical support members, wherein the chair legs are made of wood," is indefinite because the term "legs" has no antecedent basis in the claim. Although "legs" may be an example of "vertical support members," the term "legs" is of an arguably very different scope than the phrase "vertical support members." Both terms cannot be used in the same claim to represent the same thing. This problem can easily be avoided if each item recited in a claim is always referred to, both in the specification and throughout the claims, in exactly the same way. The discussion below concerns how the Federal Circuit has addressed claim ambiguities. None of the ambiguities, however, are of the technical sort that can arise from inferential introduction of a term without a positively recited antecedent basis for the simple reason that claims containing terms that lack such antecedent basis should never have survived the examination process.

Third, questions of claim validity and claim infringement are virtual mirror images of each other. In typical practice, invalidity and noninfringement are often raised in tandem as defenses by a party accused of infringing a patentee's claim.²⁴ The accused infringer will argue that if a patentee's claim is interpreted broadly enough to encompass his accused device, then the claim is invalid for being broader than is justifiable based on the specification or as being so broad as to cover the prior art. Conversely, if the claim is narrow

ous).

23. See *id.* § 2173.05(e) ("[L]ack of clarity could arise where a claim refers to 'said lever' or 'the lever,' when the claim contains no earlier recitation or reference to a lever and where it would be unclear as to what element the limitation was making reference."); see also *Environmental Instruments, Inc. v. Sutron Corp.*, 877 F.2d 1561, 1564-65, 11 U.S.P.Q.2d (BNA) 1132, 1135 (Fed. Cir. 1989) (discussing patent examiner's finding of lack of antecedent basis in patent application for reason of indefiniteness in claim terms).

24. See, e.g., *Autogiro Co. of Am. v. United States*, 384 F.2d 391, 395, 155 U.S.P.Q. (BNA) 697, 701 (Cl. Cl. 1967).

enough to be valid, the argument will be made that the claim can not encompass the device at issue. In rendering its decision in an action for patent infringement, a court often must rule on both the question of validity and the question of infringement.²⁵ For both determinations, the claims at issue as a general rule will be interpreted by a court in the same way.²⁶ The examples that follow emphasize claim interpretation for the purpose of assessing infringement, but the analyses of the Federal Circuit's interpretive techniques in that context apply to assessing claim validity as well.

Fourth, patent claims usually contain three distinct parts: a preamble, which introduces the claim; a transition word or phrase; and last, the body of the claim.²⁷ Terms in the preamble and transition may confer additional claim limitations. Most of the time, questions of interpretation are directed to the body of claims, because a claim's body is its principle source of limitations. Therefore, the examples below emphasize the interpretation of terms within the body of a claim, although preamble terms are briefly considered as well. Insofar as the proper construction of transition terms²⁸ is relatively well settled in U.S. patent law, extended discussion of such terms is excluded from the scope of this Article.²⁹

25. Indeed, a holding of noninfringement by an appellate court does not relieve that court's responsibility to dispose of validity issues. See *Cardinal Chem. Co. v. Morton Int'l, Inc.*, 508 U.S. 83, 99-101 (1993).

26. See *Beachcombers v. WildeWood Creative Prods., Inc.*, 31 F.3d 1154, 1163, 31 U.S.P.Q.2d (BNA) 1653, 1660 (Fed. Cir. 1994) ("We have already interpreted the claims for purposes of assessing their validity. The same interpretation of course applies to the infringement analysis." (citing *Senmed, Inc. v. Richard-Allen Med. Indus., Inc.*, 888 F.2d 815, 828 n.7, 12 U.S.P.Q.2d (BNA) 1508, 1511 n.7 (Fed. Cir. 1989))).

27. Some claims also contain a concluding phrase that "sums up" the claim by reciting what the elements of the claim accomplish. In general, when a concluding phrase does nothing more than state the results of the limitations in the claim, the phrase "adds nothing to the patentability or substance of the claim," and as such, does not confer a further limitation on the claim. See *Texas Instruments Inc. v. United States Int'l Trade Comm'n*, 988 F.2d 1165, 1172, 26 U.S.P.Q.2d (BNA) 1018, 1023-24 (Fed. Cir. 1993).

28. The transition term is usually one of the following three: "consisting of," "consisting essentially of," and "comprising." "Comprising" is the most common, as it is the broadest.

29. The phrase "consisting of" limits the claim to only those elements recited in the body of the claim following the transition phrase. Thus, if a claim recites "A product consisting of elements A and B," a product that contains elements A, B and C will probably not infringe. See *Mannesmann Demag Corp. v. Engineered Metal Prods. Co.*, 793 F.2d 1279, 1282-83, 230 U.S.P.Q. (BNA) 45, 47 (Fed. Cir. 1986) (noting that while the phrase "consisting of" when used in the preamble, will exclude from infringement a device containing additional elements, it will not exclude from infringement such a device when used in an element of a claim and not in the preamble). The phrase "consisting essentially of" is a bit broader; usually reserved for claims directed to compositions of matter, the phrase excludes from the scope of the claim additional ingredients that materially affect the nature of the composition recited in the claim, but includes additional elements that do not materially affect the nature of the recited composition. The partly open, partly closed nature of the "consisting essentially of" language may allow an applicant to avoid prior art while still allowing for a relatively broad reading of the claim. See *United States Steel Corp. v. Phillips Petroleum Co.*, 865 F.2d 1247, 1248, 9 U.S.P.Q.2d (BNA)

Finally, once a claim has been interpreted by a court, an accused product or process can be found to infringe a patent claim in one of two ways: either literally or under the "doctrine of equivalents." Literal infringement will be found if an accused product or process meets each and every limitation of a properly interpreted claim.³⁰ Under the doctrine of equivalents, infringement may also be found even if each claim limitation is not literally met, so long as the differences between the accused product or process and the claimed invention, with respect to each claim limitation, are insubstantial as determined by the trier of fact.³¹ The doctrine of equivalents can thus, in effect, expand the reach of a claim beyond the bounds accorded to it by the Federal Circuit's interpretation of the claim's language.³² Most of the discussion below concerns the claim interpretation process *per se*, which occurs as the first step in an infringement analysis.³³ The last section focuses on the relationship between claim interpretation and the doctrine of equivalents.

1461, 1462 (Fed. Cir. 1989) (affirming district court's finding that patent was invalid and infringed); Harold C. Wegner, *U.S. Claim Interpretation in Patent Infringement in the United States of America* (Kyoto Seminar) (1992). The phrase "comprising" is the broadest of the transition phrases, and encompasses any number of additional elements, whether material or immaterial. See *Moleculon Research Corp. v. CBS, Inc.*, 793 F.2d 1261, 1263, 229 U.S.P.Q. (BNA) 805, 806 (Fed. Cir. 1986) (discussing patent infringement action brought by assignee of inventor of cube puzzle).

30. The proposition that a finding of infringement cannot lie unless an accused product or process meets each and every limitation in the patentee's claim is traditionally known as the "all elements rule." See *Athletic Alternatives, Inc. v. Prince Mfg., Inc.*, 73 F.3d 1573, 1582 n.8, 37 U.S.P.Q.2d (BNA) 1365, 1373 n.8 (Fed. Cir. 1996); *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 117 S. Ct. 1040, 1049 (1997); *Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 931, 935, 949, 4 U.S.P.Q.2d (BNA) 1737, 1739-40, 1751-52 (Fed. Cir. 1987); see also *supra* note 7 and accompanying text (discussing aspects of literal infringement).

31. See *Becton Dickinson & Co. v. C.R. Bard, Inc.*, 922 F.2d 792, 796, 17 U.S.P.Q.2d (BNA) 1097, 1101 (Fed. Cir. 1990) ("To establish infringement of a patent, every limitation set forth in a claim must be found in an accused product or process exactly or by a substantial equivalent." (citing *Corning Glass Works v. Sumimoto Elec. U.S.A., Inc.*, 868 F.2d 1251, 1259, 9 U.S.P.Q.2d (BNA) 1962, 1967 (Fed. Cir. 1989))). See *Hilton Davis*, 117 S. Ct. at 1046-47. The doctrine of equivalents was interpreted by the Supreme Court to require that infringement occur only if the accused device "performs substantially the same function in substantially the same way to obtain the same result." *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 608 (1950) (quoting *Sanitary Refrigerator Co. v. Winters*, 280 U.S. 30, 42 (1929)).

32. The Supreme Court in March 1997 directly addressed the doctrine of equivalents in *Hilton Davis*, 117 S. Ct. at 1044. Addressing the concern that the doctrine was being interpreted too broadly, the Court affirmed the use of the doctrine of equivalents so long as it is applied "to each of the individual elements of a claim, rather than to the accused product or process as a whole." See *id.*

33. See *Carroll Touch, Inc. v. Electro Mechanical Sys., Inc.*, 15 F.3d 1573, 1576, 27 U.S.P.Q.2d (BNA) 1836, 1839 (Fed. Cir. 1993) (describing the two prongs of infringement analysis as (1) properly construing the claim "to determine its scope and meaning," and (2) comparing "the claim as properly construed to the accused device or process").

II. WHERE THE COURT LOOKS TO INTERPRET CLAIMS

To resolve ambiguities in claim language, a court will look to four basic places for guidance: the claim language itself, the specification, the prosecution history,³⁴ and extrinsic evidence (such as dictionaries, treatises, and expert testimony). As discussed above, *Markman* and its progeny make a trial or reviewing court's reliance on the last source, extrinsic evidence, especially expert testimony regarding the interpretation of claim terms, entirely discretionary.³⁵

The facts and legal analysis in *Markman* itself serve to illustrate these principles as a steppingstone to further discussion. Markman invented a system to track articles of clothing and associated business transactions for use in the dry cleaning industry.³⁶ Markman's claims were drawn to an "inventory and control reporting system."³⁷ Westview produced and sold an electronic system capable of tracking cash and invoice totals, but not articles of clothing.³⁸ Markman sued Westview, alleging that Westview's system, by virtue of tracking cash and invoices, fulfilled Markman's claim requirement of tracking "inventory."³⁹ Westview countered that cash and invoices do not constitute "inventory."⁴⁰ Thus, Markman argued for a broad definition of the term "inventory," while Westview maintained that the term narrowly referred to articles of clothing.⁴¹

The Federal Circuit agreed with Westview's interpretation for reasons grounded in the Court's analysis of Markman's claim

34. See *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979, 34 U.S.P.Q.2d (BNA) 1321, 1329 (Fed. Cir. 1995) (noting that prosecution history included arguments made by applicant's attorney during the 'give and take' process of obtaining a patent (citing *Unique Concepts, Inc. v. Brown*, 939 F.2d 1558, 19 U.S.P.Q.2d (BNA) 1500 (Fed. Cir. 1991))), *aff'd*, 116 S. Ct. 1384 (1997). The Federal Circuit has made clear since *Markman* that the prosecution history is to be viewed broadly, encompassing not only attorney argument, but also such other sources as information disclosure statements ("IDS") submitted during prosecution. See *Ekchian v. Home Depot, Inc.*, 104 F.3d 1299, 1303, 41 U.S.P.Q.2d (BNA) 1364, 1368 (Fed. Cir. 1997) (concluding that "an IDS is part of the prosecution history on which the examiner, the Courts, and the public are entitled to rely").

35. See *Markman*, 52 F.3d at 980, 34 U.S.P.Q.2d (BNA) at 1331 (noting usefulness of extrinsic evidence, especially expert testimony, to "explain scientific principles, the meaning of technical terms, and terms of art").

36. See *id.* at 971-73, 34 U.S.P.Q.2d (BNA) at 1322-24 (describing problems related to dry cleaning industry and Markman's patented inventions).

37. *Id.*, 34 U.S.P.Q.2d (BNA) at 1322-24.

38. See *id.* at 972-73, 34 U.S.P.Q.2d (BNA) at 1324 (detailing mechanics of the DATAMARK and DATASCAN systems).

39. See *id.* at 972-74, 34 U.S.P.Q.2d (BNA) at 1324-25 (contesting the district court's grant of judgment as a matter of law in the Court of Appeals for the Federal Circuit).

40. See *id.*, 34 U.S.P.Q.2d (BNA) at 1324-25; *id.* at 979-83, 34 U.S.P.Q.2d (BNA) at 1329-33 (reaching a definition of "inventory" by focusing on patent and prosecution history).

41. See *id.* at 981-83, 34 U.S.P.Q.2d (BNA) at 1331-33.

language, specification, and prosecution history.⁴² First, Markman's claim recited a system that was to "detect and localize spurious additions to inventory as well as spurious deletions therefrom."⁴³ The Federal Circuit noted that cash and invoice totals "are not 'localized' because dollars do not travel through the cleaning process and the location of invoices is irrelevant."⁴⁴ Thus, the Federal Circuit concluded that the claim language itself makes little sense if Markman's proposed broad interpretation of the term "inventory" is correct.⁴⁵

Second, the Federal Circuit noted that the specification was "pervasive" in using the term "inventory" with overt reference to articles of clothing, and cited several passages in the specification to this effect.⁴⁶ Third, the Federal Circuit pointed to the patent's prosecution history, in which Markman, among other things, specifically added limitations to its claims that intrinsically related the term "inventory" to "articles [of clothing]" in order to overcome a rejection on grounds of obviousness over the prior art.⁴⁷ Finally, the Federal Circuit refused to give any deference to Markman's expert testimony as to the broad interpretation of "inventory" because it was irreconcilable with the overwhelming evidence proffered by the language of the claim, the specification, and the file history.⁴⁸

III. GENERAL PRINCIPLES OF CLAIM INTERPRETATION

A. *Claim Terms Will Be Given Their Conventional Meaning When They Are Not Otherwise Defined in the Specification*

It is well established in U.S. patent practice that a patent applicant can attribute whatever meaning to a claim term he chooses, so long as the term is clearly defined in the specification, and the definition is used consistently throughout the specification and claims.⁴⁹ This

42. See *id.* at 979-83, 34 U.S.P.Q.2d (BNA) at 1329-33 (rejecting Markman's contention that the jury properly considered all the evidence concerning the disputed claim term in reaching the conclusion that the term does not require articles of clothing).

43. *Id.* at 971, 34 U.S.P.Q.2d (BNA) at 1323.

44. *Id.* at 983, 34 U.S.P.Q.2d (BNA) at 1333.

45. See *id.*, 34 U.S.P.Q.2d (BNA) at 1333 (refusing to allow extrinsic evidence introduced by Markman to change the meaning of the claims).

46. See *id.* at 982, 34 U.S.P.Q.2d (BNA) at 1331-32 ("The specification is pervasive in using the term 'inventory' to consist of 'articles of clothing.'").

47. See *id.*, 34 U.S.P.Q.2d (BNA) at 1332 (noting Markman's comments to the examiner that the "applicant's system is operable to keep a running reconcilable inventory total by adding input articles and subtracting output articles, and also protects against the possibility of undocumented . . . articles entering the system").

48. See *id.* at 983, 34 U.S.P.Q.2d (BNA) at 1333.

49. See MPEP, *supra* note 19, §§ 2111.01, 2173.01.

basic principle is often expressed as the general rule that "an applicant may be his or her own lexicographer as long as the meaning assigned to the term is not repugnant to the term's well known usage."⁵⁰ However, if a patentee does not assign an unconventional meaning to a claim term during prosecution, a court will interpret that term during litigation as having its conventionally accepted meaning to one of skill in the art.⁵¹ As the Federal Circuit pointed out in *Intellicall, Inc. v. Phonometrics, Inc.*,⁵²

"So long as the meaning of an expression is made reasonably clear and its use is consistent within a patent disclosure, an inventor is permitted to define the terms of his claims. Nevertheless, the place to do so is in the specification of the inventor's application, and the time to do so is prior to that application acquiring its own independent life as a technical disclosure through its issuance as a United States patent. The litigation-induced pronouncements of [the inventor] . . . have no effect on what the words of that document in fact do convey and have conveyed during its term to the public."⁵³

The following examples illustrate and elaborate on this basic principle, both with respect to ordinary words in common usage and technical terms of art.

1. "Ordinary" terms

Consistent with the general rule recited above, an ordinary, nontechnical term has generally been accorded its plain meaning by the Federal Circuit unless the specification or prosecution history indicates otherwise.⁵⁴ A patentee's failure to adopt, either through explicit definition or clear usage, an unconventional meaning in the specification will preclude later arguments by the patentee that an alternative definition is correct.⁵⁵ Expert testimony is unlikely to

50. See *id.*; see also *Fromson v. Advance Offset Plate, Inc.*, 720 F.2d 1565, 1569, 219 U.S.P.Q. (BNA) 1137, 1140 (Fed. Cir. 1983) ("The dictionary does not always keep abreast of inventors. It cannot. 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." (quoting *Autogiro Co. of Am. v. United States*, 384 F.2d 391, 397, 155 U.S.P.Q. 697, 702 (Ct. Cl. 1967))).

51. See *Markman*, 52 F.3d at 980, 34 U.S.P.Q.2d (BNA) at 1330.

52. 952 F.2d 1384, 21 U.S.P.Q.2d (BNA) 1383 (Fed. Cir. 1992).

53. *Intellicall, Inc. v. Phonometrics, Inc.*, 952 F.2d 1384, 1388, 21 U.S.P.Q.2d (BNA) 1383, 1386 (Fed. Cir. 1992) (quoting *Lear Siegler, Inc. v. Aeroquip Corp.*, 733 F.2d 881, 889, 221 U.S.P.Q. (BNA) 1025, 1031 (Fed. Cir. 1984)).

54. See *id.* at 1387, 21 U.S.P.Q.2d (BNA) at 1385 ("[W]here a disputed term would be understood to have its ordinary meaning by one of skill in the art from the patent and its history, extrinsic evidence that the inventor may have subjectively intended a different meaning does not preclude summary judgment.").

55. See *id.*, 21 U.S.P.Q.2d (BNA) at 1386 (stating that time for adoptions is prior to patent issuance).

persuade a court that it should adopt a contrary meaning, especially when the specification and prosecution history employ the term in a conventional manner.⁵⁶

For example, *Senmed, Inc. v. Richard-Allen Medical Industries, Inc.*⁵⁷ involved the mechanism by which a novel surgical stapler advances along an incision to insert staples.⁵⁸ The patentee's claim recited the phrase "to place a forwardmost staple *on* said anvil surface . . ."⁵⁹ The accused stapler, by contrast, utilized an advancing mechanism that placed the forwardmost staple above, rather than in physical contact with, the stapler's anvil surface.⁶⁰ The patentee argued that the term "on" actually meant "juxtaposed," and thus did not limit the claim to require actual contact.⁶¹ The inventor offered testimony to this effect at trial.⁶² The defendant, understandably, argued the opposite point of view.⁶³

The Federal Circuit found that three different sources supported the defendant's position. First, the dictionary defined "on" as "position of contact," while "juxtaposed" was defined as "side by side."⁶⁴ Second, the specification offered no contrary definition of its own for the term "on."⁶⁵ Third, the prosecution history showed that the patentee in fact required "close adjacency" (i.e., "on") as a necessary limitation to distinguish over prior art.⁶⁶ In view of this evidence, the Federal Circuit found that the expert testimony offered by the patentee to broaden the definition of "on" "was of little if any significance."⁶⁷ The court further stated the more general proposition, quoted with approval in *Vitronics* and in its predecessor post-*Markman* case *Southwall Technologies*,⁶⁸ that "an inventor may not be heard to proffer an interpretation that would alter the undisputed

56. See *id.*, 21 U.S.P.Q.2d (BNA) at 1386 (noting that the existence of extrinsic evidence that the inventor might have subjectively intended a different meaning does not preclude summary judgment).

57. 888 F.2d 815, 12 U.S.P.Q.2d (BNA) 1508 (Fed. Cir. 1989).

58. *Senmed, Inc. v. Richard-Allen Med. Indus., Inc.*, 888 F.2d 815, 816, 12 U.S.P.Q.2d (BNA) 1508, 1509 (Fed. Cir. 1989).

59. *Id.* at 816, 12 U.S.P.Q.2d at 1509 (emphasis added).

60. See *id.* at 817, 12 U.S.P.Q.2d (BNA) at 1510.

61. See *id.* at 819, 12 U.S.P.Q.2d (BNA) at 1512.

62. See *id.*, 12 U.S.P.Q.2d (BNA) at 1512.

63. See *id.*, 12 U.S.P.Q.2d (BNA) at 1512.

64. *Id.* at 819-20 n.9, 12 U.S.P.Q.2d (BNA) at 1512-13 n.9 (quoting WEBSTER'S NEW COLLEGIATE DICTIONARY 623, 1276 (1979)).

65. *Id.* at 817-18, 12 U.S.P.Q.2d (BNA) at 1511.

66. See *id.*, 12 U.S.P.Q.2d (BNA) at 1512.

67. *Id.* at 817 n.8, 12 U.S.P.Q.2d (BNA) at 1512 n.8 (finding expert testimony irrelevant as to definition of "on").

68. See *supra* note 15 and accompanying text (expressing the principle that the prosecution history and intrinsic evidence of the claim should be sufficient to put a competitor skilled in the art on notice as what is claimed under the patent).

public record (claim, specification, prosecution history) and treat the claim as a 'nose of wax.'⁶⁹

By contrast, in *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*,⁷⁰ the decisive issue was the proper interpretation of the term "smooth."⁷¹ The patentee developed a novel process for etching identifying marks on contact lenses.⁷² A major problem that needed to be solved in the art was how to etch the lens in a manner that would eliminate the eye irritation otherwise caused by rough surfaces formed on the lens as a result of conventional etching processes.⁷³ The patentee solved the problem by supplying a "smooth surface of unsublimated polymer material" that surrounded etched areas of the lens.⁷⁴ When the defendant produced and marketed a similar lens, the patentee filed suit. Barnes-Hind defended its position by showing that under a scanning electron microscope, its lenses were not, in fact, "smooth" (as conventionally defined), as required by the patentee's claim.⁷⁵ The Federal Circuit rejected the argument, noting that "resort to the specification clearly demonstrates that 'smooth' meant that 'the edges of the craters neither inflame nor irritate the eyelid of the lens wearer,'" a definition satisfied by the defendant's lens.⁷⁶ The specification's apparent linkage of the term "smooth" to its function in the invention saved the patentee from being limited to a puritanically conventional usage of the term.⁷⁷

2. *Technical terms*

The general proposition that claim terms are accorded their ordinary meaning to one of skill in the art unless otherwise defined in the specification applies to technical terms of art as well. However, the inquiry into how one of skill in the art would conventionally

69. *Senmed*, 888 F.2d at 819 n.8, 12 U.S.P.Q.2d (BNA) at 1512 n.8. For another example where the Federal Circuit found recourse in a simple dictionary definition dispositive of a claim term's interpretation, see *Hoganas AB v. Dresser Indus., Inc.*, 9 F.3d 948, 951 n.8, 28 U.S.P.Q.2d (BNA) 1936, 1938 n.8 (Fed. Cir. 1993) (holding use of the term "straw-shaped" in claim "imposes the requirement that the channel-forming elements be hollow" based on Webster's New World Dictionary's definition of "straw" as "hollow stalks or stems of grain after threshing").

70. 796 F.2d 443, 230 U.S.P.Q. (BNA) 416 (Fed. Cir. 1986).

71. *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 796 F.2d 443, 450, 230 U.S.P.Q. (BNA) 416, 421 (Fed. Cir. 1986).

72. *See id.* at 445, 230 U.S.P.Q. (BNA) at 417.

73. *See id.*, 230 U.S.P.Q. (BNA) at 417.

74. *See id.*, 230 U.S.P.Q. (BNA) at 417.

75. *See id.* at 450, 230 U.S.P.Q. (BNA) at 421.

76. *See id.*, 230 U.S.P.Q. (BNA) at 421.

77. The Federal Circuit's recourse to usage of a claim term in the context of function can also be seen at work, albeit with opposite results as to a literal infringement finding, in the post-*Markman* case, *Ethicon Endo-Surgery, Inc. v. United States Surgical Corp.*, 93 F.3d 1572, 40 U.S.P.Q.2d (BNA) 1019 (Fed. Cir. 1996).

understand a claim term can be somewhat more complex than for ordinary terms. The post-*Markman* cases of *Vitronics Corp. v. Conception, Inc.*⁷⁸ and *Southwall Technologies, Inc. v. Cardinal IG Co.*⁷⁹ provide considerable guidance as to how the Federal Circuit interprets technical terms of art.

In *Vitronics*, the patentee had invented a method for soldering electrical devices to circuit boards.⁸⁰ At issue was the proper interpretation of the claim phrase “solder reflow temperature.”⁸¹ The patentee (*Vitronics*) argued that the phrase should be construed to mean “the temperature reached by the solder during the period it is reflowing during the final stages of the soldering process”⁸² On the other hand, the accused infringer (*Conception*) argued that the phrase “the liquidus temperature of a particular type of solder known as 63/37 (Sn/Pb) solder” should be construed as the temperature at which a particular solder first begins to melt (183 degrees Celsius).⁸³ Under the accused infringer’s definition, there could be no literal infringement, since the method used by *Conception* employed a higher temperature.

Conception offered expert testimony and other extrinsic evidence in the form of technical literature articles in support of its definition.⁸⁴ The Federal Circuit, however, found *Conception*’s extrinsic evidence unconvincing in light of its analysis of *Vitronics*’ intrinsic evidence in the form of its specification:

[T]he “peak reflow temperature” and “liquidus temperature” are clearly defined in the specification as having distinctly different meanings Moreover, in the preferred embodiment described in the patent, the solder is heated to a temperature of 210 [degrees] Therefore, in order to be consistent with the specification and preferred embodiment described therein, [the claim at issue] must be construed such that the term “solder reflow temperature” means the peak reflow temperature, rather than the liquidus temperature. Indeed, if “solder reflow temperature” were defined to mean liquidus temperature, a preferred (and indeed only) embodiment in the specification would not fall within the scope of the patent claim. Such an interpretation is rarely, if ever,

78. 90 F.3d 1576, 39 U.S.P.Q.2d (BNA) 1573 (Fed. Cir. 1996).

79. 54 F.3d 1570, 34 U.S.P.Q.2d (BNA) 1673 (Fed. Cir. 1995).

80. *Vitronics Corp. v. Conception, Inc.*, 90 F.3d 1576, 1579-80, 39 U.S.P.Q.2d (BNA) 1573, 1574 (Fed. Cir. 1996).

81. *Id.* at 1579-80, 39 U.S.P.Q.2d (BNA) at 1574.

82. *Id.*, 39 U.S.P.Q.2d (BNA) at 1574.

83. *See id.* at 1580, 39 U.S.P.Q.2d (BNA) at 1574.

84. *See id.* at 1584-85, 39 U.S.P.Q.2d (BNA) at 1578-79.

correct and would require highly persuasive evidentiary support, which is wholly absent in this case.⁸⁵

The *Vitronics* case thus illustrates the preferred recourse by the Federal Circuit to intrinsic evidence in the interpretation of technical terms of art. Moreover, the case also illustrates the basic precept of claim interpretation that claims will generally not be construed in a manner that excludes the patentee's preferred embodiments disclosed in its specification.

In *Southwall Technologies, Inc. v. Cardinal IG Co.*,⁸⁶ the patentee claimed a novel heat mirror useful as a window glazing material.⁸⁷ Heat mirrors "generally comprise[] one or more thin layers of silver, which are transparent to visible light but reflect heat, spaced apart by a layer of dielectric material . . . that decreases the reflection and increases the transmission of visible light."⁸⁸

At issue was the proper interpretation of the phrase "wherein the dielectric is a sputter-deposited dielectric."⁸⁹ If the sputter-depositing process broadly encompassed either a one- or two-step process, then Cardinal's heat mirror infringed Southwall's claim. If, on the other hand, the claimed sputter-depositing process encompassed only a narrow, single-step process, Cardinal's heat mirror did not literally infringe. Relying on Southwall's prosecution history as dispositive of the proper claim interpretation, the district court concluded as a matter of law that Cardinal's heat mirror did not infringe Southwall's claim.⁹⁰

The Federal Circuit affirmed, reasoning that "the prosecution history limits the interpretation of 'sputter-deposited dielectric' layer to exclude any dielectric layer formed by the two-step process."⁹¹ As explained by the court, Southwall had "amended an independent claim to describe the dielectric as a 'sputter-deposited inorganic metal oxide, compound or salt,'"⁹² to claim the process described in its specification, which utilizes "processes in which the metal is sputtered off of a metal target and *directly converted to the oxide* . . ." and thereby distinguish the prior art.⁹³ The Federal Circuit thus reasoned, "[i]n

85. *Id.* at 1583, 39 U.S.P.Q.2d (BNA) at 1577-78.

86. 54 F.3d 1570, 34 U.S.P.Q.2d (BNA) 1673 (Fed. Cir. 1995); *see supra* notes 15, 78 and accompanying text.

87. *Southwall Techs., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1573, 34 U.S.P.Q.2d (BNA) 1673, 1674 (Fed. Cir. 1995).

88. *Id.*, 34 U.S.P.Q.2d (BNA) at 1674.

89. *Id.* at 1574, 34 U.S.P.Q.2d (BNA) at 1675.

90. *See id.* at 1575, 34 U.S.P.Q.2d (BNA) at 1676.

91. *Id.* at 1576, 34 U.S.P.Q.2d (BNA) at 1677.

92. *Id.*, 34 U.S.P.Q.2d (BNA) at 1677.

93. *Id.*, 34 U.S.P.Q.2d (BNA) at 1677.

[its] response Southwall necessarily disclaimed the examiner's interpretation of 'sputter-deposited' metal oxides as encompassing a two-step process in which metal is first deposited as a metal and then oxidized.⁹⁴ Moreover, in response to Southwall's contention that the arguments it made with respect to certain claims did not necessarily apply to others, the Federal Circuit noted that:

"Sputter-deposited dielectric" cannot be interpreted differently in different claims because claim terms must be interpreted consistently. Interpretation of a disputed claim term requires reference not only to the specification and prosecution history, but also to other claims. The fact that we must look to other claims using the same term when interpreting a term in an asserted claim mandates that the term be interpreted consistently in all claims.⁹⁵

The Federal Circuit thus reiterated the precept of claim interpretation that "arguments made during prosecution regarding the meaning of a claim term are relevant to the interpretation of that term in every claim of the patent absent a clear indication to the contrary."⁹⁶

In view of the conclusive interpretation that could be achieved through recourse to Southwall's prosecution history, the Federal Circuit rejected Southwall's proffered expert testimony regarding whether Cardinal's dielectric layer could be characterized as a sputter-deposited dielectric as providing merely conclusory legal opinions.⁹⁷ Accordingly, the Federal Circuit affirmed the lower court's finding of no infringement.⁹⁸

It is instructive to compare the Federal Circuit's treatment of expert testimony regarding the meaning of a technical term in *Southwall* with its treatment of expert testimony in the pre-*Markman* case, *Moeller v. Ionetics, Inc.*⁹⁹ In *Moeller*, the patentee claimed a novel electrode system for detecting ions.¹⁰⁰ The accused infringer, Ionetics, argued that the Ionetics electrode protruded *from* the "electrode body" housing the electrode, whereas the patentee Moeller's claims called for an electrode disposed *within* said body.¹⁰¹ Moeller's expert explained that the term "electrode" is itself ambiguous and can be

94. *Id.*, 34 U.S.P.Q.2d (BNA) at 1677.

95. *Id.* at 1579, 34 U.S.P.Q.2d (BNA) at 1679 (internal citations omitted).

96. *Id.*, 34 U.S.P.Q.2d (BNA) at 1679.

97. *See id.* at 1578, 34 U.S.P.Q.2d (BNA) at 1678 (citing *Becton Dickinson & Co. v. C.R. Bard, Inc.*, 922 F.2d 792, 797, 17 U.S.P.Q.2d (BNA) 1097, 1100 (Fed. Cir. 1990)).

98. *See id.* at 1576, 34 U.S.P.Q.2d (BNA) at 1676 (holding that, as a matter of law, Cardinal's product did not infringe).

99. 794 F.2d 653, 229 U.S.P.Q. (BNA) 992 (Fed. Cir. 1986).

100. *Moeller v. Ionetics, Inc.*, 794 F.2d 653, 654-55, 229 U.S.P.Q. (BNA) 992, 993 (Fed. Cir. 1986).

101. *See id.*, 229 U.S.P.Q. (BNA) at 993-94 (emphasis added).

understood to encompass either the sensing tip of the electrode, the entire length of the conducting wire of the electrode, or the entire electrode system.¹⁰² Neither the specification nor anything in the prosecution history specified which was the intended definition.¹⁰³ Clearly, if either of the latter two definitions were correct, infringement could be found.¹⁰⁴

In granting Ionetics's motion for partial summary judgment of noninfringement, the lower court refused to consider the expert's testimony, reasoning that the patentee's claim and the accused device were "sufficiently simple to be understood without the aid of experts."¹⁰⁵ The Federal Circuit reversed, reasoning that while the use of expert testimony is generally at the trial judge's discretion, in this case "the meanings of key terms in the claim were clearly disputed."¹⁰⁶ "In a patent case involving complex scientific principles," the court reasoned, "it is particularly helpful to see how those skilled in the art would interpret the claim."¹⁰⁷

In the wake of *Markman* and its progeny, and in view of *Southwall* in particular, the statement in *Moeller* that cases involving complex technology require a court to consider expert testimony as to how one of skill in the art would interpret a claim, and that a court's failure to do so is an abuse of discretion,¹⁰⁸ is put into question.¹⁰⁹

Nevertheless, in the post-*Markman* case, *Hoechst Celanese Corp. v. BP Chemicals Ltd.*,¹¹⁰ the Federal Circuit treated expert testimony "as cumulative to the other evidence, and as enlarging our understanding of the technology and the usage of the disputed [claim] terms."¹¹¹ At issue in *Hoechst* was the meaning of the term "stable" in regard to a method for removing iodide compounds from a non-aqueous

102. See *id.* at 657, 229 U.S.P.Q. (BNA) at 994.

103. See *id.*, 229 U.S.P.Q. (BNA) at 994.

104. See *id.*, 229 U.S.P.Q. (BNA) at 994-95.

105. *Id.*, 229 U.S.P.Q. (BNA) at 995.

106. *Id.*, 229 U.S.P.Q. (BNA) at 994.

107. *Id.*, 229 U.S.P.Q. (BNA) at 995. Indeed, the court concluded that "the trial judge's failure to allow such testimony was an abuse of discretion." *Id.*, 229 U.S.P.Q. (BNA) at 995.

108. See *id.*, 229 U.S.P.Q. (BNA) at 995.

109. As the court pointed out in *Markman*:

When legal "experts" offer their conflicting views of how the patent should be construed, or where the legal expert's view of how the patent should be construed conflicts with the patent document itself, such conflict does not create a question of fact nor can the expert opinion bind the court or relieve the court of its obligation to construe the claims according to the tenor of the patent.

Markman v. Westview Instruments, Inc., 52 F.3d 967, 983, 34 U.S.P.Q.2d (BNA) 1321, 1333 (Fed. Cir. 1995), *aff'd*, 116 S. Ct. 1384 (1996).

110. 78 F.3d 1575, 38 U.S.P.Q.2d (BNA) 1126 (Fed. Cir. 1996).

111. *Hoechst Celanese Corp. v. BP Chems. Ltd.*, 78 F.3d 1575, 1580, 38 U.S.P.Q.2d (BNA) 1126, 1130 (Fed. Cir. 1996).

organic medium, which required a "resin which is stable in the organic medium . . ." ¹¹² As Hoechst's specification defined "stable" as meaning "[t]hat the resin will not chemically decompose, or change more than about 50 percent of its dry physical *dimension* upon being exposed to the organic medium containing the iodide compounds," ¹¹³ the claim interpretation issue revolved around the meaning of the term "dimension." BP argued that "dry physical dimension" referred to volume and, thus, its process did not infringe. ¹¹⁴ According to Hoechst, however, "dimension" is a linear measure and, therefore, did give rise to infringement. ¹¹⁵

Hoechst and BP proffered conflicting expert testimony as to the conventional art definition of "dimension," and both parties offered dictionary definitions supporting their respective positions. ¹¹⁶ The district court found Hoechst's expert "highly credible," and further reasoned that BP's definition would exclude Hoechst's preferred embodiment described in its specification. ¹¹⁷ Accordingly, the lower court found literal infringement. ¹¹⁸

In reviewing the district court's decision, the Federal Circuit noted that:

This court has occasionally relied on general and technical dictionaries to determine the meaning of technical and other terms. In this case the dictionaries do not distinguish in a dispositive manner between the contested technical meanings. Further, a general dictionary definition is secondary to the specific meaning of a technical term as it is used and understood in a particular technical field. ¹¹⁹

The court then quoted from Hoechst's expert's testimony, observing that "[a]lthough we are at a disadvantage in attempting to make credibility determinations, the inventor's testimony reads as that of an expert in the field." ¹²⁰ The court continued by stating that although

112. *Id.* at 1578, 38 U.S.P.Q.2d (BNA) at 1128.

113. *Id.* at 1578-79, 38 U.S.P.Q.2d (BNA) at 1129 (emphasis added).

114. *See id.* at 1579, 38 U.S.P.Q.2d (BNA) at 1129.

115. *See id.*, 38 U.S.P.Q.2d (BNA) at 1129.

116. *See id.* at 1579-80, 38 U.S.P.Q.2d (BNA) at 1129-30. Hoechst presented the definition of "dimension" as "measure in one direction . . . (specifically) one of three coordinates determining a position in space or four coordinates determining a position in space and time." WEBSTER'S COLLEGIATE DICTIONARY 355 (1988). BP presented the definition of "dimension" as "a measurable extent of any kind, as length, breadth, depth, area, and volume." CONCISE OXFORD DICTIONARY OF CURRENT ENGLISH 327 (8th ed. 1990).

117. *See id.* at 1580, 38 U.S.P.Q.2d (BNA) at 1130.

118. *See id.* at 1577, 38 U.S.P.Q.2d (BNA) at 1128.

119. *Id.* at 1580, 38 U.S.P.Q.2d (BNA) at 1130 (citing Hormone Research Found., Inc., v. Genentech, Inc., 904 F.2d 1558, 1563, 15 U.S.P.Q.2d (BNA) 1039, 1043-44 (Fed. Cir. 1990)).

120. *Id.*, 38 U.S.P.Q.2d (BNA) at 1130 (citing Palumbo v. Don-Joy Co., 762 F.2d 969, 976, 226 U.S.P.Q. (BNA) 5, 9 (Fed. Cir. 1985), *overruled on other grounds by* Markman v. Westview

"*Markman* requires us to give no deference to the testimony of the inventor about the meaning of the claims. . . . [W]e have treated [the inventor's] testimony as cumulative to the other evidence, and as enlarging our understanding of the technology and the usage of the disputed terms."¹²¹ Accordingly, the Federal Circuit affirmed the district court's holding of infringement.¹²²

The Federal Circuit, thus, even post-*Markman*, clearly has not precluded consideration of expert testimony as a claim interpretation tool. It may sometimes be necessary to rely on expert testimony to establish the conventional meaning of a technical term of art when intrinsic evidence is absent. It appears more likely to be relied upon when it is cumulative of other evidence.¹²³ It is difficult, however, to articulate a bright line rule as to when expert testimony will be judged mere opinion that carries no weight, and when it will be considered as "enlarging [the court's] understanding of the technology and the usage of . . . disputed [claim] terms."¹²⁴

In closing this discussion, it is interesting to consider the question of at what point in time the Federal Circuit will judge the conventional meaning of a claim term. In other words, will the conventional meaning be ascertained as of the time of filing a patent application, or at the time of infringement? It could be argued that insofar as the patentee's intent as to the meaning of a claim term is generally dispositive of a claim interpretation, the meaning of the term as of filing will control. As the Federal Circuit's decision in *United States Steel Corp. v. Phillips Petroleum Co.*¹²⁵ appears to show, however, technical terms used conventionally by a patentee can take on an increasingly broad scope over time as the relevant art gradually recognizes that term as conventionally encompassing a concomitantly wider scope of embodiments.¹²⁶ Indeed, claims reciting such technical terms may become enforceable by the patentee against unforeseen embodiments never even contemplated by the patentee in the specification. In *Phillips Petroleum*, the Federal Circuit justified such practice, reasoning that "[a] patent applicant is not required . . . to

Instruments, Inc., 52 F.3d 967, 979, 34 U.S.P.Q.2d (BNA) 1321, 1329 (Fed. Cir. 1995), *aff'd*, 116 S. Ct. 1384 (1996)).

121. *Id.*, 38 U.S.P.Q.2d (BNA) at 1130.

122. *See id.* at 1581, 38 U.S.P.Q.2d (BNA) at 1130, *aff'g* 846 F. Supp. 542, 31 U.S.P.Q.2d (BNA) 1825 (S.D. Tex. 1994).

123. *See id.* at 1580, 38 U.S.P.Q.2d (BNA) at 1130.

124. *Id.*, 38 U.S.P.Q.2d (BNA) at 1130.

125. 865 F.2d 1247, 9 U.S.P.Q.2d (BNA) 1461 (Fed. Cir. 1989).

126. *See United States Steel Corp. v. Phillips Petroleum Co.*, 865 F.2d 1247, 1252, 9 U.S.P.Q.2d (BNA) 1461, 1465 (Fed. Cir. 1989) (illustrating that the meaning of technical claim terms may be expanded over time).

predict every possible variation, improvement[,] or commercial embodiment of his invention."¹²⁷ A brief look at the *Phillips Petroleum* case will help clarify this curious situation.

In the early 1950s, Phillips Petroleum filed a patent application for crystalline polypropylene.¹²⁸ Over the years, crystalline polypropylene has become a ubiquitous product in the chemical industry because of its tough, stress-resistant, yet malleable properties that make it highly suitable for a wide variety of molding and packaging applications.¹²⁹

Phillips' claim at issue recited: "Normally solid polypropylene, consisting essentially of recurring propylene units, having a substantial *crystalline polypropylene* content."¹³⁰ Phillips charged U.S. Steel with patent infringement for producing and selling a particular form of crystalline polypropylene.¹³¹ As a defense, U.S. Steel countered that its crystalline polypropylene was of higher molecular weight and viscosity that any of the crystalline polypropylene molecules described in Phillips' patent. Accordingly, U.S. Steel argued, Phillips' claim was not entitled to Phillips' earliest filing date of 1953, because the 1953 application and claim did not comply with the written description requirement of 35 U.S.C. § 112, first paragraph.¹³² Intervening prior art therefore rendered Phillips' claim invalid as anticipated under 35 U.S.C. § 102.¹³³

It was uncontested that Phillips did not disclose in its 1953 specification a crystalline polypropylene form having the physical properties of U.S. Steel's product.¹³⁴ In fact, the U.S. Steel product was neither known in the art at the time Phillips filed its patent application nor even contemplated in theory as being commercially viable or important.¹³⁵

Nevertheless, the Federal Circuit affirmed the lower court's finding of both validity and infringement.¹³⁶ The Federal Circuit quoted *In re Koller* for the proposition that "language in a specification is to be understood for what it meant to one having ordinary skill in the art at the time the application was filed' and noting that support need be

127. *Id.* at 1250, 9 U.S.P.Q.2d (BNA) at 1463 (alteration in original).

128. *See id.*, 9 U.S.P.Q.2d (BNA) at 1463.

129. *See id.*, 9 U.S.P.Q.2d (BNA) at 1463-64.

130. *Id.* at 1249, 9 U.S.P.Q.2d (BNA) at 1463 (emphasis added).

131. *See id.* at 1248, 9 U.S.P.Q.2d (BNA) at 1462.

132. *See id.* at 1250, 9 U.S.P.Q.2d (BNA) at 1465 (U.S. Steel contending that the rule of law is "[i]f [a claim] embraces subject matter for which no adequate basis exists in the underlying disclosure, the claim is too broad").

133. *See id.* at 1248-49, 9 U.S.P.Q.2d (BNA) at 1462-63.

134. *See id.* at 1250, 9 U.S.P.Q.2d (BNA) at 1463.

135. *See id.* at 1252, 9 U.S.P.Q.2d (BNA) at 1465.

136. *See id.* at 1254, 9 U.S.P.Q.2d (BNA) at 1466.

found for only the claimed invention, in view of how one skilled in the art at that time would construe the claims and would read its specification."¹³⁷ The Federal Circuit then pointed out that whether the claim at issue "may cover a later version of the claimed composition (crystalline polypropylene with higher intrinsic viscosity and average molecular weight) relates to infringement, not patentability," and that "[c]ertainly, the disclosure of specifics *adds* to the understanding one skilled in the art would glean from a generic term, but it does not follow that such added disclosure *limits* the meaning thereof."¹³⁸

While the issue in *Phillips* was claim validity, the case can, in essence, embrace later embodiments not originally contemplated by the term at the time of an application's filing date, so long as at the time of filing, the claim was commensurate in scope with the disclosure, and the claim term, by virtue of its later-developed conventional meaning (i.e., at the time of infringement) embraces an accused product or process.

3. *Imprecise claim terms*

As the Federal Circuit pointed out in *Andrew Corp. v. Gabriel Electronics, Inc.*,¹³⁹ imprecise claim terms are ubiquitous in patent claims.¹⁴⁰ "Such [terms], when serving reasonably to describe the claimed subject matter to those of skill in the field of the invention, and to distinguish the claimed subject matter from the prior art, have been accepted in patent examination and upheld by the courts."¹⁴¹

As to the question of the extent of a claim's expansion in scope afforded by use of imprecise claim terms, the Federal Circuit noted in *Pall Corp. v. Micron Separations Inc.*¹⁴² that "[t]he use of the word 'about' avoids a strict numerical boundary to the specified parameter. Its range must be determined in its technologic and stylistic context . . . [including] the patent specification, the prosecution history, and other claims."¹⁴³

137. *Id.* at 1251, 9 U.S.P.Q.2d (BNA) at 1465 (quoting *In re Koller*, 613 F.2d 819, 824, 204 U.S.P.Q. (BNA) 702, 706 (C.C.P.A. 1977)).

138. *See id.* at 1251-52, 9 U.S.P.Q.2d (BNA) at 1466.

139. 847 F.2d 819, 6 U.S.P.Q.2d (BNA) 2010 (Fed. Cir. 1988).

140. *See Andrew Corp. v. Gabriel Elecs., Inc.*, 847 F.2d 819, 821, 6 U.S.P.Q.2d (BNA) 2010, 2012 (Fed. Cir. 1988).

141. *Id.*, 6 U.S.P.Q.2d (BNA) at 2012.

142. 66 F.3d 1211, 36 U.S.P.Q.2d (BNA) 1225 (Fed. Cir. 1995).

143. *Pall Corp. v. Micron Separations, Inc.*, 66 F.3d 1211, 1217, 36 U.S.P.Q.2d (BNA) 1225, 1229 (Fed. Cir. 1995).

The reference in *Pall* to the specification, prosecution history, and other claims suggests that the *modus operandi* used by the Federal Circuit in interpreting imprecise claim terms is, in essence, not any different from that employed in interpreting other terms. The case of *Quantum Corp. v. Rodime, PLC*¹⁴⁴ lends further credence to this proposition. Rodime attempted to amend a claim during a reexamination proceeding.¹⁴⁵ By statute, claim scope cannot be expanded in any manner during such a proceeding.¹⁴⁶ Rodime's original claim included the phrase "at least 600 tracks per inch" ("tpi").¹⁴⁷ During reexamination, however, Rodime amended the claim to recite "at least approximately 600 tpi."¹⁴⁸

The court held that the amendment was in violation of 35 U.S.C. § 305 because it expanded the scope of the original claim.¹⁴⁹ In particular, the court pointed out that, according to *Webster's Third New International Dictionary*, "approximately" means "reasonably close to."¹⁵⁰ Therefore, as opposed to the original claim, which had a precise lower limit, the amended claim "defined an open-ended range starting *slightly below* 600."¹⁵¹

In *Conopco Inc. v. May Department Stores, Inc.*,¹⁵² the Federal Circuit needed to determine not only whether an imprecise claim term expanded claim scope *per se*, but also whether the expansion of claim scope afforded by the imprecise claim was sufficient to ensnare an accused infringer.¹⁵³ The patentee (Conopco) argued for an expansive interpretation of the phrase "about 40:1" (referring to a chemical ratio) in order to obtain a decision of literal infringement as to May's material having a ratio of 162.9:1.¹⁵⁴ The court pointed out that "the relevant inquiry . . . is whether one of skill in the art would have understood that the term was to be used expansively."¹⁵⁵ The court rejected Conopco's position because "the specification and prosecution history do not support the argument that the inventors

144. 65 F.3d 1577, 36 U.S.P.Q.2d (BNA) 1162 (Fed. Cir. 1995).

145. *Quantum Corp. v. Rodime, PLC*, 65 F.3d 1577, 1579, 36 U.S.P.Q.2d (BNA) 1162, 1164 (Fed. Cir. 1995).

146. See 35 U.S.C. § 305 (1994).

147. See *Quantum Corp.*, 65 F.3d at 1579, 36 U.S.P.Q.2d (BNA) at 1163-64.

148. *Id.*, 36 U.S.P.Q.2d (BNA) at 1164.

149. See *id.* at 1581, 36 U.S.P.Q.2d (BNA) at 1166.

150. *Id.*, 36 U.S.P.Q.2d (BNA) at 1166 (quoting WEBSTER'S THIRD NEW WORLD DICTIONARY 107 (1986)).

151. *Id.*, 36 U.S.P.Q.2d (BNA) at 1166 (emphasis added).

152. 46 F.3d 1556, 32 U.S.P.Q.2d (BNA) 1225 (Fed. Cir. 1994).

153. See *Conopco Inc. v. May Dep't Stores, Inc.*, 46 F.3d 1556, 1560-61, 32 U.S.P.Q.2d (BNA) 1225, 1227 (Fed. Cir. 1994).

154. See *id.* at 1561, 32 U.S.P.Q.2d (BNA) at 1227.

155. *Id.*, 32 U.S.P.Q.2d (BNA) at 1228.

used this term differently from its ordinary meaning."¹⁵⁶ The court looked to a standard dictionary to find the "ordinary meaning" of the term "about," and concluded that its meaning was "approximately."¹⁵⁷ As such, the four-fold higher ratio of the accused material was held to be clearly out of range of "about 40:1," as one of ordinary skill in the art "would have no reason to believe that the term 'about' meant other than what it says."¹⁵⁸

While the Federal Circuit was able to dispose of *Conopco* by simple recourse to a dictionary definition, the reference in *Pall* to "technologic and stylistic context" extends the interpretative process beyond this simple recourse to an inquiry into how one of skill in the relevant art would understand the range imparted by an imprecise claim term when viewed in light of the specification and prosecution history.¹⁵⁹ As articulated by the Federal Circuit in *Seattle Box Co. v. Industrial Crating & Packing, Inc.*¹⁶⁰ years before the *Pall* decision:

when a word of degree is used, the district court must determine whether the patent's specification provides some standard for measuring that degree. The trial court must decide, that is, whether one of ordinary skill in the art would understand what is claimed when the claim is read in light of the specification.¹⁶¹

Functional criteria given in the specification can serve as indices of "technologic context." For example, in *Seattle Box*, the court needed to interpret the phrase "substantially equal to or greater than the thickness of the tier of pipe lengths" as applied to certain divider blocks, in order to assess a claim's validity in light of the accused infringer's assertion of indefiniteness.¹⁶² In making its determination, the court noted that the specification elaborated that "the

156. *Id.*, 32 U.S.P.Q.2d (BNA) at 1227. The "ordinary meaning" of the term "about" was held by the court to be its dictionary definition, "approximately." See *id.* at 1561 n.2, 32 U.S.P.Q.2d (BNA) at 1227 n.2; see also WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 5 (1981). As such, the four-fold higher ratio of the accused material was held to be clearly out of range of "about 40:1." See *Conopco*, 46 F.3d at 1561, 32 U.S.P.Q.2d (BNA) at 1228. Interpretations that include ranges up to two times a particular value have, however, been upheld. See, e.g., *Hybritech Inc. v. Abbott Labs.*, 849 F.2d 1446, 1455, 7 U.S.P.Q.2d (BNA) 1191, 1199 (Fed. Cir. 1988) (finding "at least about 10⁸ liters/mole" literally infringed by 4.8 x 10⁷ liters/mole and 7.1 to 7.5 x 10⁷ liters/mole).

157. See *Conopco*, 46 F.3d at 1561, 32 U.S.P.Q.2d (BNA) at 1227.

158. See *id.*, 32 U.S.P.Q.2d (BNA) at 1228.

159. See *Pall Corp. v. Micron Separations, Inc.*, 66 F.3d 1211, 1217, 36 U.S.P.Q.2d (BNA) 1225, 1229 (Fed. Cir. 1995).

160. 731 F.2d 818, 221 U.S.P.Q. (BNA) 568 (Fed. Cir. 1984).

161. *Seattle Box Co. v. Industrial Crating & Packing, Inc.*, 731 F.2d 818, 826, 221 U.S.P.Q. (BNA) 568, 571 (Fed. Cir. 1984); see *Rosemount, Inc. v. Beckman Instruments, Inc.*, 727 F.2d 1540, 1547, 221 U.S.P.Q. (BNA) 1, 7 (Fed. Cir. 1984) (finding that "'close proximity' is as precise as the subject matter permits").

162. See *Seattle Box*, 731 F.2d at 821-22, 221 U.S.P.Q. (BNA) at 571.

divider blocks are intended to absorb the weight of overhead loads."¹⁶³ Accordingly, thickness values that do not meet this functional criterion would not infringe the claim reciting the term "substantially equal to."¹⁶⁴ One of skill in the art could thus determine from the claim language what did, and did not, infringe the claim.¹⁶⁵ The court, therefore, affirmed the district court's finding of claim validity.¹⁶⁶

That one of skill in the art could determine whether a product or process infringes a claim with an imprecise claim term based on a reading of the claim language in light of the specification bespeaks recourse to fact finding on this issue. Interestingly, the Federal Circuit in the post-*Markman* case, *Modine Manufacturing Co. v. United States International Trade Commission*,¹⁶⁷ has lent credence to this proposition.

In *Modine*, the claim at issue was drawn to a condenser used in automobile air conditioners.¹⁶⁸ The claim recited, in relevant part, "flow paths being of *relatively small hydraulic diameter*."¹⁶⁹ Several Japanese companies manufactured condensers in Japan and imported them into and sold them in the United States.¹⁷⁰ *Modine* charged these companies with violation of section 337 of the Tariff Act.¹⁷¹ The record showed that the accused Japanese products had hydraulic diameters of between 0.0424 and 0.0682 inches.¹⁷² The International Trade Commission ("ITC") held that "relatively small," as recited in *Modine's* claim at issue, had an upper limit of 0.040, and accordingly held no infringement either literally or under the doctrine of equivalents.¹⁷³ *Modine* then appealed to the Federal Circuit.

163. *Id.* at 826, 221 U.S.P.Q. (BNA) at 574.

164. *Id.*, 221 U.S.P.Q. (BNA) at 574.

165. *See id.*, 221 U.S.P.Q. (BNA) at 573-74.

166. *See id.*, 221 U.S.P.Q. (BNA) at 573-74. The court also noted that a claim may be held valid even if some experimentation would be required to determine whether a particular value within a range marked by an imprecise claim term meets a particular functional requirement. *See id.*, 221 U.S.P.Q. (BNA) at 574. In this regard, it is interesting to note that in *Pall*, the court suggested that "it is appropriate to consider the effects of varying [a] parameter" in construing the scope afforded by imprecise claim terms. *See Pall Corp. v. Micron Separations, Inc.*, 66 F.3d 1211, 1217, 36 U.S.P.Q.2d (BNA) 1225, 1228 (Fed. Cir. 1995).

167. 75 F.3d 1545, 37 U.S.P.Q.2d (BNA) 1609 (Fed. Cir. 1996).

168. *See Modine Mfg. Co. v. United States Int'l Trade Comm'n*, 75 F.3d 1545, 1549, 37 U.S.P.Q.2d (BNA) 1609, 1610 (Fed. Cir. 1986).

169. *Id.*, 37 U.S.P.Q.2d (BNA) at 1611.

170. *See id.* at 1548, 37 U.S.P.Q.2d (BNA) at 1610.

171. *See id.*, 37 U.S.P.Q.2d (BNA) at 1610 (charging importation of automotive condensers by the Japanese companies that manufactured them violated section 337 of the Tariff Act, 19 U.S.C. § 1337 (1994)).

172. *See id.* at 1554, 37 U.S.P.Q.2d (BNA) at 1615.

173. *See id.* at 1550-51, 37 U.S.P.Q.2d (BNA) at 1612.

On appeal, the Federal Circuit noted that insofar as the hydraulic diameter range described in the grandparent specification was reduced in the parent and child applications from 0.070 inches (in the grandparent) to 0.040 inches (in the parent and child), a construction embracing diameters up to 0.070 inches was precluded.¹⁷⁴ However, the Federal Circuit also noted that:

The specification uses the qualifier "about," and also states that the optimum hydraulic diameter varies with the conditions. Such broadening usages as "about" must be given reasonable scope; they must be viewed by the decisionmaker as they would be understood by persons experienced in the field of the invention. Although it is rarely feasible to attach a precise limit to "about," the usage can usually be understood in light of the technology embodied in the invention. When the claims are applied to an accused device, it is a question of technologic fact whether the accused device meets a reasonable meaning of "about" in the particular circumstances.¹⁷⁵

Moreover, citing various precedents, the Federal Circuit explicitly observed that "[p]recedent illustrates the fact-dependency of determinations of the technologic scope of 'about' and similar terms, depending on their context and the precision or significance of the measurements used."¹⁷⁶ Because the ITC failed to consider "the effect of relevant factors such as the nature of the coolant and the precision of the measurement,"¹⁷⁷ the Federal Circuit vacated the judgment below and remanded the case for consideration of whether the accused devices literally infringed the claims.¹⁷⁸

Such a factual determination as to whether a particular set of values fell within the purview of an imprecise claim term was dispositive in *Hybritech Inc. v. Abbott Laboratories*,¹⁷⁹ a case cited by the *Modine* court.¹⁸⁰ In affirming the lower court's issuance of a preliminary injunction against the accused infringer, Abbott Laboratories, the Federal Circuit reviewed whether Hybritech had established a reasonable likelihood of success at proving infringement of Hybritech's claim for a monoclonal antibody sandwich diagnostic kit that required antibodies having an affinity of "at least about 10⁸ liters/mole."¹⁸¹ The district court made the factual finding that the

174. *See id.* at 1554, 37 U.S.P.Q.2d (BNA) at 1614-15.

175. *Id.*, 37 U.S.P.Q.2d (BNA) at 1615 (internal citations omitted).

176. *Id.*, 37 U.S.P.Q.2d (BNA) at 1615.

177. *Id.* at 1554-55, 37 U.S.P.Q.2d (BNA) at 1615.

178. *See id.* at 1555, 37 U.S.P.Q.2d (BNA) at 1615.

179. 849 F.2d 1446, 7 U.S.P.Q.2d (BNA) 1191 (Fed. Cir. 1988).

180. *See Modine*, 75 F.2d at 1554, 37 U.S.P.Q.2d (BNA) at 1615 (citing *Hybritech Inc. v. Abbott Labs.*, 849 F.2d 1446, 1455, 7 U.S.P.Q.2d (BNA) 1191, 1199 (Fed. Cir. 1988)).

181. *Hybritech*, 849 F.2d at 1455, 7 U.S.P.Q.2d (BNA) at 1199.

term "about" as used in Hybritech's claim encompassed a two- to three-fold measurement error (presumably inherent in the relevant art), and as such, found that Abbott's accused products fell within the literal scope of the claim.¹⁸²

Recourse to factual findings as suggested in *Modine* and as illustrated by the decision in *Hybritech* suggests that expert testimony may be able to play a role in deciding infringement issues based on a claim interpretation of imprecise claim terms, even in the post-*Markman* era. Additional credence for this proposition is provided in the post-*Markman* case *Pall Corp. v. Micron Separations Inc.*¹⁸³

In *Pall*, the patentee (Pall) claimed materials having a substance ratio of "about 5:1 to about 7:1."¹⁸⁴ The accused material had a ratio of 4:1.¹⁸⁵ The court found no literal infringement because Dr. Pall, the inventor, testified that the ratio of 3:1 was purposely excluded from the claim, based on experiments showing that the only commercially available material having this ratio did not have certain requisite functional properties, whereas materials having a 5:1 ratio did have these properties.¹⁸⁶ No experiments were conducted in the range of 3:1 to 5:1, however.¹⁸⁷ In effect, Dr. Pall had placed the lower limit of operability of the invention at 5:1.¹⁸⁸ Citing *Markman* for the proposition that "[e]xtrinsic evidence of meaning and usage in the art may be helpful in determining the criticality of the parameter [at issue], and may be received from the inventor and others skilled in the field of the invention,"¹⁸⁹ the court found that 4:1 was not intended by the patentee and, therefore, was excluded from the range of "about 5:1 to about 7:1."¹⁹⁰

The utility of expert testimony in persuading a court as to a particular claim interpretation of an imprecise claim term should, however, be viewed with caution. First, the inventor's testimony in *Pall* was akin to a declaration against interest, and thus was perhaps intrinsically more believable to the court.¹⁹¹ Second, the *Pall* decision

182. See *id.*, 7 U.S.P.Q.2d (BNA) at 1199.

183. 66 F.3d 1211, 36 U.S.P.Q.2d (BNA) 1225 (Fed. Cir. 1995).

184. *Pall Corp. v. Micron Separations, Inc.*, 66 F.3d 1211, 1217, 36 U.S.P.Q.2d (BNA) 1225, 1229 (Fed. Cir. 1995).

185. See *id.*, 36 U.S.P.Q.2d (BNA) at 1229.

186. See *id.* at 1217-18, 36 U.S.P.Q.2d (BNA) at 1229.

187. See *id.*, 36 U.S.P.Q.2d (BNA) at 1229.

188. See *id.* at 1218, 36 U.S.P.Q.2d (BNA) at 1229.

189. *Id.* at 1217, 36 U.S.P.Q.2d (BNA) at 1229 (citing *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 980, 34 U.S.P.Q.2d (BNA) 1321, 1330 (Fed. Cir. 1995), *aff'd*, 116 S. Ct. 1384 (1996)).

190. *Id.* at 1217-18, 36 U.S.P.Q.2d (BNA) at 1229.

191. See *id.*, 36 U.S.P.Q.2d (BNA) at 1229. Dr. Pall's testimony that nylon with a ratio of 3:1 to 5:1 was never tested because it was not commercially available at the time and that the "claims

preceded the dictum in *Vitronics* warning that expert testimony is likely to play a role in only rare circumstances.¹⁹² Third, even pre-*Markman* decisions have made clear that expert opinions may be insufficient to convince a court that a particular interpretation of an imprecise claim term is correct.¹⁹³

For example, in *W.L. Gore & Associates Inc. v. Garlock Inc.*,¹⁹⁴ the patentee (Gore) claimed a material having a stretch rate of "about 100% per second."¹⁹⁵ The accused material was held not to infringe because the patentee offered as the only evidence for its broad interpretation of "about" expert opinion testimony setting a range of 76.5% to 139%.¹⁹⁶ The court found that this expert testimony was inadequate to sustain the patentee's burden of proof of infringement on a preponderance of the evidence standard.¹⁹⁷

While opportunities may remain for the effective use of expert testimony in aiding the court's interpretation of imprecise claim terms, those opportunities remain limited.

4. *Alternative definitions*

A particularly difficult situation arises when a specification supplies two or more definitions of varying scope for a given claim term. As a general principle, a court will interpret such a claim term as having the narrowest definition. For example, in *Genentech Inc. v. Wellcome Foundation Ltd.*,¹⁹⁸ the patentee (Genentech) charged Wellcome Foundation and codefendants with infringement of its patent drawn to recombinantly produced "human tissue plasminogen activator" ("hTPA").¹⁹⁹ The allegedly infringing molecules were structurally and functionally similar, but not identical, to the naturally occurring hTPA claimed by Genentech.²⁰⁰ A decisive issue in the case was how

were 'actually rather narrow'" had the effect of declarations against interest on his claim of patent infringement. See *id.* at 1218-20, 36 U.S.P.Q.2d (BNA) at 1229-31.

192. See *id.* at 1216-17, 36 U.S.P.Q.2d (BNA) at 1228-29 (stating that "[e]xtrinsic evidence of meaning and usage" provided by experts may be accepted by the court as an interpretation aid when needed).

193. See *W.L. Gore & Assocs. Inc. v. Garlock Inc.*, 842 F.2d 1275, 1280, 6 U.S.P.Q.2d (BNA) 1277, 1282 (Fed. Cir. 1988) ("Where the evidence of infringement consists merely of one expert's opinion, . . . the district court is under no obligation to accept it.").

194. 842 F.2d 1275, 6 U.S.P.Q.2d (BNA) 1277 (Fed. Cir. 1988).

195. *W.L. Gore & Assocs. Inc. v. Garlock Inc.*, 842 F.2d 1275, 1280, 6 U.S.P.Q.2d (BNA) 1277, 1282 (Fed. Cir. 1988).

196. See *id.*, 6 U.S.P.Q.2d (BNA) at 1282.

197. See *id.*, 6 U.S.P.Q.2d (BNA) at 1282.

198. 29 F.3d 1555, 31 U.S.P.Q.2d (BNA) 1161 (Fed. Cir. 1994).

199. *Genentech Inc. v. Wellcome Found. Ltd.*, 29 F.3d 1555, 1559, 31 U.S.P.Q.2d (BNA) 1161, 1168 (Fed. Cir. 1994).

200. See *id.* at 1569, 31 U.S.P.Q.2d (BNA) at 1172 (finding similarities in "binding function" of each product insufficient to demonstrate patent infringement in light of "profound

broadly to interpret hTPA—in particular, whether its definition was limited to the exact sequence of the natural molecule, or whether the definition also encompassed variants having particular structural and functional properties.²⁰¹ Despite Genentech's expert testimony that a broad-scope definition was warranted,²⁰² the Federal Circuit chose the former, narrower interpretation,²⁰³ and as such, found no infringement.²⁰⁴

Genentech provided in its specification no fewer than four different definitions for hTPA, each of a different scope.²⁰⁵ The Federal Circuit reasoned that choosing the narrowest definition was the "appropriate method to follow because it avoids the possibility of an applicant obtaining in court a scope of protection which encompasses subject matter that, through the conscious efforts of the applicant, the [Patent Office] did not examine."²⁰⁶

In the post-*Markman* decision, *Athletic Alternatives, Inc. v. Prince Manufacturing, Inc.*,²⁰⁷ the Federal Circuit reiterated the proposition that a court will choose the narrowest among alternative definitions for a claim term. The patentee (Athletic Alternatives) claimed a generic sports racket having a novel stringing system, in which string segments were fastened in a particular order and geometric pattern.²⁰⁸ The claim language at issue in the dispute recited how the relative distances (denoted d_i) between individual string segments were to be constructed:

[W]here at least said first ends of at least said first plurality of string segments are secured to said frame at a distance d_i , . . . and where said distance d_i varies between minimum distances for the first and last string ends in said sequence and a maximum distance for a string end between said first and last string ends in said sequence.²⁰⁹

differences in the[ir] properties and structure").

201. See *id.* at 1563-65, 31 U.S.P.Q.2d (BNA) at 1166-68 (detailing scope of issue to be adjudicated).

202. See *id.* at 1564, 31 U.S.P.Q.2d (BNA) at 1168 (summarizing thrust of appellant's expert witness evidence).

203. See *id.*, 31 U.S.P.Q.2d (BNA) at 1168.

204. See *id.* at 1569, 31 U.S.P.Q.2d (BNA) at 1172.

205. See *id.* at 1563-64, 31 U.S.P.Q.2d (BNA) at 1167 (characterizing four definitions as (1) narrow structural definition, (2) broader structural definition, (3) even broader structural definition, and (4) functional definition).

206. *Id.* at 1564, 31 U.S.P.Q.2d (BNA) at 1167.

207. 73 F.3d 1573, 37 U.S.P.Q.2d (BNA) 1365 (Fed. Cir. 1996).

208. See *Athletic Alternatives, Inc. v. Prince Mfg., Inc.*, 73 F.3d 1573, 1575, 37 U.S.P.Q.2d (BNA) 1365, 1367 (Fed. Cir. 1996) (detailing specifics of patentee's claims).

209. *Id.* at 1577, 37 U.S.P.Q.2d (BNA) at 1369.

The case turned on the interpretation of the phrase "varies between."²¹⁰ Athletic Alternatives contended that the phrase requires that a string racket needs to have at least two offset distances, a minimum value and a maximum value.²¹¹ Prince argued that the phrase should be interpreted more narrowly, to require at least three offset distances: a minimum, a maximum, and at least one value in between.²¹² Since Prince's racket only employed two offset distances, it argued that its racket did not infringe Athletic Alternatives's claim.²¹³

Athletic Alternatives did not supply a definition for the conventional term "between" in its specification, and the Federal Circuit, predictably, chose to assign the ordinary, accepted meaning to the term.²¹⁴ The dictionary supplied alternative definitions for "between," however, some supporting Athletic Alternatives and others supporting Prince.²¹⁵ Moreover, the Federal Circuit found that the specification and the prosecution history could themselves be construed as supporting either party's position.²¹⁶

The Federal Circuit resolved the dilemma by accepting the narrower definition, which required at least three offset distances, and thus found for Prince.²¹⁷ In doing so, the Court based its reasoning on the requirements of 35 U.S.C. § 112, paragraph 2, which requires that an applicant for a patent "*distinctly* claim[] the subject matter which the applicant regards as his invention."²¹⁸ The purpose of the requirement, noted the Federal Circuit, is "to guard against

210. *Id.* at 1578-79, 37 U.S.P.Q.2d (BNA) at 1370.

211. *See id.* at 1580-81, 37 U.S.P.Q.2d (BNA) at 1372.

212. *See id.* at 1581, 37 U.S.P.Q.2d (BNA) at 1372.

213. *See id.*, 37 U.S.P.Q.2d (BNA) at 1372.

214. *See id.* at 1578, 37 U.S.P.Q.2d (BNA) at 1370 (explaining that because there was no indication that Athletic Alternatives "sought to assign claim terms anything but their ordinary and accustomed meanings, those are the meanings that we must give them").

215. *See id.* at 1579-81, 37 U.S.P.Q.2d (BNA) at 1371-72.

216. *See id.*, 37 U.S.P.Q.2d (BNA) at 1371-72. The Federal Circuit also attempted to resolve the ambiguity by considering Athletic Alternatives's recourse to the "doctrine of claim differentiation," which states that limitations in narrower claims cannot be imported into broader ones. *See id.* at 1580, 37 U.S.P.Q.2d (BNA) at 1372. As such, the presence of narrower claims containing particular limitations may allow the inference that the broader claims do not contain these limitations. Athletic Alternatives contended that since one of its narrower claims used the term "continuously" instead of "between," and since "continuously" clearly requires more than two offset distances, "between" should, therefore, be construed broadly. *See id.*, 37 U.S.P.Q.2d (BNA) at 1372. However, the Federal Circuit pointed out that "continuously" is still narrower than "between," even if "between" is taken to mean that at least three offset distances are required. *See id.* at 1580-81, 37 U.S.P.Q.2d (BNA) at 1372. The Federal Circuit therefore rejected Athletic Alternatives's argument. *See id.* at 1581, 37 U.S.P.Q.2d (BNA) at 1372.

217. *See id.* at 1581-83, 37 U.S.P.Q.2d (BNA) at 1372-74.

218. *See id.* at 1581, 37 U.S.P.Q.2d (BNA) at 1372 (quoting 35 U.S.C. § 112 (1994) (emphasis added)).

unreasonable advantages to the patentee and disadvantages to others arising from uncertainty as to their [respective] right.”²¹⁹ The Federal Circuit concluded:

Were we to allow [Athletic Alternatives] successfully to assert the broader of the two senses of “between” against Prince, we would undermine the fair notice function of the requirement that the patentee distinctly claim the subject matter disclosed in the patent from which he can exclude others temporarily. Where there is an equal choice between a broader and a narrower meaning of a claim, and there is an enabling disclosure that indicates that the applicant is at least entitled to a claim having the narrower meaning, we consider the notice function of the claim to be best served by adopting the narrower meaning.²²⁰

As the above cases illustrate, alternative definitions should be avoided. Technical terms with well-accepted meanings in the art should generally be used in their normal manner, unless some unique advantage is gained from a nonconventional definition, in which case a single nonconventional definition should be clearly stated and consistently used.

B. Limitations in the Specification Will Not Be Read into the Claims

As indicated in this Article’s introduction, an applicant for a patent need only describe in the specification a “best mode embodiment” of the invention.²²¹ The best mode embodiment will generally be a detailed description of a product or process and may contain many structural or process elements.²²² An applicant need not claim each of these elements.²²³ Indeed, an applicant may be able to claim the invention in significantly broader terms than the best mode, provided the broadly claimed invention is enabled by the specification.²²⁴

219. *Id.*, 37 U.S.P.Q.2d (BNA) at 1372 (quoting *General Elec. Co. v. Wabash Appliance Corp.*, 304 U.S. 364, 369 (1938)).

220. *Id.*, 37 U.S.P.Q.2d (BNA) at 1372.

221. *See supra* note 4 and accompanying text; *see also* 35 U.S.C. § 112.

222. *See* 3 ANTHONY W. DELLER, WALKER ON PATENTS §§ 10:11, 10:17 (3d ed. 1985 & Supp. 1996) (indicating optimal method for describing patent’s “best mode embodiment”).

223. *See id.*

224. *See id.* § 10:18. During the examination process, the USPTO will assess whether broader claims are enabled by the specification, and whether the broad claims encompass prior art. If one of ordinary skill in the art could make and use embodiments encompassed by the broad claim based on the best mode disclosure, and there is no material prior art, then the applicant may be entitled to the broad claim. *See Spectra-Physics, Inc. v. Coherent, Inc.*, 827 F.2d 1524, 1532, 3 U.S.P.Q.2d (BNA) 1737, 1742 (Fed. Cir. 1987).

1. Illustrations of the general rule

A case in point with respect to this proposition can be found in *Specialty Composites v. Cabot Corp.*²²⁵ The patentee (Cabot) claimed a novel earplug made of polymeric foam that can rebound to its original dimensions after being compressed.²²⁶ An earplug of this sort can be inserted into the ear when compressed by one's fingers; after the user lets go, the earplug expands to form a comfortable and virtually complete seal of the ear canal.²²⁷ The claims at issue recited such an earplug, composed of "a resilient plasticized polymeric foam having a sufficiently high concentration of organic plasticizer" to enable a rate of expansion falling within certain defined parameters.²²⁸ Cabot accused Specialty Composites of producing an infringing earplug.²²⁹

Specialty argued against infringement on the ground that whereas its earplugs used internal plasticizers, Cabot's specification only contemplated external plasticizers.²³⁰ The Court rejected Specialty's argument, reasoning that Cabot's specification "never uses the terms 'external' or 'internal' plasticizer and does not implicitly distinguish between them. The three examples of foams in the specification are externally plasticized polyvinylchloride. However, particular embodiments appearing in the specification will not generally be read into the claims."²³¹

The Federal Circuit reiterated the principle that limitations in the specification do not necessarily limit the scope of the claims in *Ekchian v. Home Depot, Inc.*²³² At issue in *Ekchian* was the meaning of the phrase "conductive liquid-like medium," as recited in Ekchian's claim to a capacitive displacement sensor useful in leveling devices.²³³ Ekchian's device was an improvement over the prior art by virtue of its replacement of typical prior art liquid dielectrics with a solid dielectric, and the replacement of a fixed capacitor plate with

225. 845 F.2d 981, 6 U.S.P.Q.2d (BNA) 1601 (Fed. Cir. 1988).

226. *Specialty Composites v. Cabot Corp.*, 845 F.2d 981, 984, 6 U.S.P.Q.2d (BNA) 1601, 1602 (Fed. Cir. 1988).

227. *See id.*, 6 U.S.P.Q.2d (BNA) at 1602.

228. *See id.*, 6 U.S.P.Q.2d (BNA) at 1602.

229. *See id.* at 985, 6 U.S.P.Q.2d (BNA) at 1603.

230. *See id.* at 986-89, 6 U.S.P.Q.2d (BNA) at 1604-06.

231. *Id.* at 987, 6 U.S.P.Q.2d (BNA) at 1604.

232. 104 F.3d 1299, 41 U.S.P.Q.2d (BNA) 1364 (Fed. Cir. 1997).

233. *See Ekchian v. Home Depot, Inc.*, 104 F.3d 1299, 1301, 41 U.S.P.Q.2d (BNA) 1364, 1366-67 (Fed. Cir. 1997).

a conductive liquid.²³⁴ These changes rendered Ekchian's device superior to prior devices in its sensitivity to tilt.²³⁵

Ekchian sued for infringement.²³⁶ The district court granted the defendant's motion for summary judgment of noninfringement on the basis of a claim construction in which the claim phrase "conductive liquid-like medium" was held to require a conductivity similar to the examples contained in Ekchian's specification.²³⁷ The lower court reasoned that Ekchian's proposed broad construction of the "conductive" term would render the term meaningless, as it would "include virtually all liquids (and indeed materials) on the planet."²³⁸ Accordingly, the district court sought a narrower interpretation.²³⁹

On review, the Federal Circuit noted that "[b]ecause the specification does not use the term 'conductive' in a special or unique way, its ordinary meaning to one skilled in the art controls."²⁴⁰ Furthermore, "[w]hile examples disclosed in the preferred embodiment may aid in the proper interpretation of a claim term, the scope of a claim is not necessarily limited by such examples."²⁴¹ The Federal Circuit rejected the lower court's argument that Ekchian's broad construction would render the term meaningless, reasoning that:

Both [defendant] and Ekchian agree that the term "conductive" ordinarily means the ability to transport electric charge. Furthermore, it is undisputed that the specification and prosecution history both state that the liquid must act as a capacitor plate, which must necessarily store electric charge. Therefore, one skilled in the art of capacitor design would recognize that the term "conductive" modifies "liquid-like medium" in the claims to indicate that the liquid must act as a capacitor plate, i.e., that it must be sufficiently more conductive than the dielectric material so that it stores electric charge.²⁴²

Thus, the Federal Circuit inferred a functional criterion that did, in effect, impose some limitation on Ekchian's claim term (thus giving it meaning), but found no reason to go so far as to import the

234. See *id.* at 1304, 41 U.S.P.Q.2d (BNA) at 1366.

235. See *id.* at 1301, 41 U.S.P.Q.2d (BNA) at 1365.

236. See *id.*, 41 U.S.P.Q.2d (BNA) at 1366.

237. See *id.* at 1302, 41 U.S.P.Q.2d (BNA) at 1366-67.

238. See *id.*, 41 U.S.P.Q.2d (BNA) at 1367 (rejecting Ekchian's definition of "conductive" as "the slightest ability to carry a current").

239. See *id.*, 41 U.S.P.Q.2d (BNA) at 1366. This claim construction precluded literal infringement. In addition, the district court found that prosecution history estoppel also precluded infringement under the doctrine of equivalents. See *id.* at 1303, 41 U.S.P.Q.2d (BNA) at 1366.

240. *Id.*, 41 U.S.P.Q.2d (BNA) at 1367 (internal citations omitted).

241. *Id.*, 41 U.S.P.Q.2d (BNA) at 1367 (internal citations omitted).

242. *Id.*, 41 U.S.P.Q.2d (BNA) at 1368.

limitations in the specification's examples.²⁴³ Accordingly, the district court's holding of no infringement was vacated and remanded for further proceedings to determine whether the liquid in the accused device acts as a capacitor plate, i.e., stores the electric charge that generates the measured capacitance.²⁴⁴ If the liquid acts as a capacitor plate, then the liquid is a "conductive liquid-like medium within the meaning of the claims."²⁴⁵

2. *A surface exception to the general rule: interpreting means-plus-function claims*

As discussed above, the Federal Circuit will look to a patent's specification for help in interpreting claim terms, but it will not import limitations from the specification into claims. However, so-called means-plus-function claim elements seemingly constitute an exception to this rule. With a means-plus-function limitation, the specification will, by statute, directly limit the claim's scope. Section 112, paragraph 6 of the patent statute pertaining to specifications of patent applications characterizes this situation:

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.²⁴⁶

The statute thus authorizes patent applicants to write structure claims that include functional phrases such as "means for weighing" instead of the term "scale."²⁴⁷ However, when Section 112, paragraph 6 is

243. See *id.*, 41 U.S.P.Q.2d (BNA) at 1368.

244. See *id.* at 1305, 41 U.S.P.Q.2d (BNA) at 1368.

245. *Id.*, 41 U.S.P.Q.2d (BNA) at 1369.

246. 35 U.S.C. § 112 (1994).

247. See *id.* A threshold question is whether a claim invokes 35 U.S.C. § 112, paragraph 6, analysis at all. The use of the word "means" in a claim raises the presumption that the drafter intended to invoke 35 U.S.C. § 116, paragraph 6. See *York Prods. Inc. v. Central Tractor Farm & Family Ctr.*, 99 F.3d 1568, 1574, 40 U.S.P.Q.2d (BNA) 1619, 1623 (Fed. Cir. 1996) (discussing role of § 112, paragraph 6 in drafting of claims); *Greenberg v. Ethicon Endo-Surgery Inc.*, 91 F.3d 1580, 1584, 39 U.S.P.Q.2d (BNA) 1783, 1786-87 (Fed. Cir. 1996) (noting that use of term "means" generally invokes § 112, paragraph 6). "Nonetheless, mere incantation of the word 'means' in a clause reciting predominantly structure cannot evoke section 112, Para. 6." *York Prods.*, 99 F.3d at 1574, 40 U.S.P.Q.2d (BNA) at 1623; see also *Waterloo Furniture Components Ltd. v. Haworth Inc.*, 798 F. Supp. 489, 493-94, 25 U.S.P.Q.2d (BNA) 1138, 1142 (N.D. Ill. 1992) ("[L]ooking at the language of the claims, the specification and the production history, we find no evidence that a person . . . would understand any of the claims in dispute, except the reference to 'first means' . . . and 'second means' . . . , to include a means-plus-function element."). However, the recitation of some elements of structure in a purported means-plus-function claim element does not automatically preclude reliance on § 112, paragraph 6. See *York Prods.*, 99 F.3d at 1574, 40 U.S.P.Q.2d (BNA) at 1623; *AMP Inc. v. Fujitsu Microelectronics Inc.*,

invoked, the specification *must* be consulted to determine what structure(s) in the specification are described that perform the function recited in the claim.²⁴⁸ Accordingly, “means for weighing” does not encompass *any* structure for weighing, but rather only those structures for weighing described in the specification, or equivalents of those structures.²⁴⁹

The facts and analysis in *In re Donaldson Co.*²⁵⁰ illustrate how means-plus-function claims are to be interpreted. Donaldson submitted a patent application directed to a novel industrial dust collector.²⁵¹ Prior art dust collectors suffered from a basic problem: filtered dust would collect and cake on the walls of the collector, eventually clogging it, and requiring stop-and-start cleaning processes to remove the hardened dust.²⁵² Donaldson’s device solved this problem by employing a flexible wall that functioned, essentially, as a diaphragm-like device that could expand in response to pressure increases.²⁵³ This movement by the flexible wall breaks up any hardened, caked-on dust.²⁵⁴ The dust then falls to the bottom of the device, where it can be easily removed.²⁵⁵

The USPTO rejected Donaldson’s device as being obvious over prior art primarily because Donaldson claimed his invention in means-plus-function format.²⁵⁶ In relevant part, the claim at issue recited “means . . . for moving particulate matter in a downward direction to a bottommost point in said portion for subsequent transfer to a location exterior to said assembly.”²⁵⁷ The claim language itself does not recite that the means must be flexible.²⁵⁸ As such, the

853 F. Supp. 808, 819, 31 U.S.P.Q.2d (BNA) 1705, 1712 (M.D. Pa. 1994) (stating that “‘means plus function’ language may be present despite the appearance of structural language so long as the structural language merely defines the function”). Our focus in this piece is on how the Federal Circuit interprets means-plus-function claims once they have been determined to fall in this category.

248. See *Specialty Composites v. Cabot Corp.*, 845 F.2d 981, 987, 6 U.S.P.Q.2d (BNA) 1601, 1604-05 (Fed. Cir. 1988).

249. See *id.*, 6 U.S.P.Q.2d (BNA) at 1605. An applicant may, in his specification, describe several alternative structures that accomplish the weighing function, and in doing so, broaden his patent. But the literal scope of the means-plus-function claim will still be restricted to the described structures and their equivalents. See *id.*, 6 U.S.P.Q.2d (BNA) at 1605.

250. 16 F.3d 1189, 29 U.S.P.Q.2d (BNA) 1845 (Fed. Cir. 1994).

251. *In re Donaldson Co.*, 16 F.3d 1189, 1190, 29 U.S.P.Q.2d (BNA) 1845, 1846 (Fed. Cir. 1994).

252. See *id.* at 1191, 29 U.S.P.Q.2d (BNA) at 1846.

253. See *id.*, 29 U.S.P.Q.2d (BNA) at 1847.

254. See *id.*, 29 U.S.P.Q.2d (BNA) at 1847.

255. See *id.*, 29 U.S.P.Q.2d (BNA) at 1847.

256. See *id.* at 1191-92, 29 U.S.P.Q.2d (BNA) at 1847-48.

257. *Id.* at 1191, 29 U.S.P.Q.2d (BNA) at 1847.

258. See *id.*, 29 U.S.P.Q.2d (BNA) at 1847. The court later discusses how flexibility appears in Scheller’s “summary of invention.” *Id.* at 1195, 29 U.S.P.Q.2d (BNA) at 1850.

USPTO found the claim obvious over the prior art, which arguably contained a structure responsive to pressure increases, which, in essence, performed the recited function of moving particulate matter in a downward direction.²⁵⁹

The Federal Circuit reversed, pointing to the Section 112, paragraph 6 requirement that when interpreting a means-plus-function claim a court must consult the specification as to the actual structures described that perform the function recited in the claim.²⁶⁰ Donaldson's specification clearly described its structure for moving particulate matter in a downward direction as requiring a flexible wall.²⁶¹ No flexible wall dust collectors existed in the prior art, and no prior art suggested making one.²⁶² Therefore, the court found Donaldson's claim to be nonobvious, and consequently, patentable.²⁶³

The court went further to point out that looking to the specification to find structural limitations when interpreting means-plus-function claims is not really an exception to the general rule that limitations in the specification are not read into claims.²⁶⁴ Rather, the court noted that "[w]hat we are dealing with . . . is the construction of a limitation already in the claim in the form of a means-plus-function clause and a statutory mandate on how that clause must be construed."²⁶⁵ Thus, means-plus-function language already incorporates, by reference to the specification, structural limitations on the scope of the means.²⁶⁶ No additional limitations are brought into the claim beyond those that were in the claim already, by virtue of the means-plus-function language.²⁶⁷

3. *Means-plus-function claim elements in infringement cases*

From the foregoing discussion, we see that a critical step in interpreting a means-plus-function claim involves determining what structures described in a patentee's specification accomplish the

259. *See id.* at 1197, 29 U.S.P.Q.2d (BNA) at 1852.

260. *See id.* at 1192-96, 29 U.S.P.Q.2d (BNA) at 1848-51.

261. *See id.* at 1195-97, 29 U.S.P.Q.2d (BNA) at 1850-52.

262. *See id.* at 1197, 29 U.S.P.Q.2d (BNA) at 1852.

263. *See id.*, 29 U.S.P.Q.2d (BNA) at 1852. In response to the *Donaldson* decision, the USPTO issued examination guidelines for examining means-plus-function claims, which incorporate the Federal Circuit's interpretation of 35 U.S.C. § 112, ¶ 6, as set forth in *Donaldson*. *See* 1162 Off. Gaz. Pat. Office 59 (May 17, 1994).

264. *See Donaldson*, 16 F.3d at 1194, 29 U.S.P.Q.2d (BNA) at 1850.

265. *Id.*, 29 U.S.P.Q.2d (BNA) at 1850.

266. *See id.*, 29 U.S.P.Q.2d (BNA) at 1850.

267. *See id.*, 29 U.S.P.Q.2d (BNA) at 1850.

functions recited in the patentee's claim.²⁶⁸ If the structure employed by the accused device is the same as, or is equivalent to, the structure that appears in a device accused of infringing the claim, then a finding of infringement is likely, assuming that the functional limitation has been met as well.²⁶⁹ A key determination concerns how much of the structure described in the specification will be used as the yardstick in assessing identity or equivalence of structure.

In *Valmont Industries, Inc. v. Reinke Manufacturing Co.*,²⁷⁰ the patentee (Valmont) claimed an irrigating apparatus.²⁷¹ The invention solved an important problem in agriculture: conventional automatic irrigation apparatuses could supply water to a circular area of land, but not to the corners of a square plot, thus rendering the corners of a square plot unusable for growing crops.²⁷² The patentee solved this problem by mounting an "extension arm" on the main, centrally pivoted arm of conventional water sprinklers.²⁷³ The "extension arm" was designed to swing out at particular intervals in order to supply water to areas missed by the main arm.²⁷⁴

A key aspect of the invention was how the device determined when the extension arm should actually extend, how far it should extend, and for how long.²⁷⁵ The patentee's claim recited the function of a critical means-plus-function limitation in extremely broad terms: "[C]ontrol means for operating said moving means to move said extension arm assembly relative to said main arm assembly."²⁷⁶

Reinke began marketing a competing extension-arm sprinkler, and Valmont filed suit for infringement.²⁷⁷ In Reinke's device, the extension arm was guided by electrical signals generated by an underground electromagnetic cable.²⁷⁸ As described by the Court, "[s]ensors on Reinke's extension arm receive signals from this buried wire. The sensors, in turn, send a steering signal to keep the wheels [of the extension arm] on the path of the buried cable. In this

268. See *supra* notes 246-67 and accompanying text.
 269. See *Valmont Indus., Inc. v. Reinke Mfg. Co.*, 983 F.2d 1039, 1042, 25 U.S.P.Q.2d (BNA) 1451, 1454 (Fed. Cir. 1993) (stating that accused device must use identical or equivalent means and function, as specified in claims, for means-plus-function limitation to apply).
 270. 983 F.2d 1039, 25 U.S.P.Q.2d (BNA) 1451 (Fed. Cir. 1993).
 271. See *Valmont Indus., Inc. v. Reinke Mfg. Co.*, 983 F.2d 1039, 1040, 25 U.S.P.Q.2d (BNA) 1451, 1452 (Fed. Cir. 1993).
 272. See *id.*, 25 U.S.P.Q.2d (BNA) at 1452.
 273. See *id.* at 1040-41, 25 U.S.P.Q.2d (BNA) at 1452-53.
 274. See *id.*, 25 U.S.P.Q.2d (BNA) at 1452-53.
 275. See *id.*, 25 U.S.P.Q.2d (BNA) at 1452-53.
 276. *Id.*, 25 U.S.P.Q.2d (BNA) at 1453.
 277. See *id.* at 1041, 25 U.S.P.Q.2d (BNA) at 1453.
 278. See *id.* at 1044, 25 U.S.P.Q.2d (BNA) at 1455.

manner, the Reinke arm follows the buried cable around the field."²⁷⁹ The lower court found that Reinke's extension arm infringed Valmont's claim, because the accused device performed the claimed function of moving the extension arm relative to the main arm assembly, and did so by employing a structure that interpreted and relayed electrical signals.²⁸⁰

The Federal Circuit reversed, reasoning that:

even though both the control means in the specification [of Valmont's patent] and the control means on Reinke's device use electric signals, the structures generating those signals are strikingly different. Reinke's structure senses electromagnetic signals from a buried cable. The invention described in [Valmont's patent] senses the angular relations between the main arm and the extension arm and generates signals to adjust and maintain that relationship as the main arm rotates.²⁸¹

The emphasis on sensing the angular relationship between the extension arm and main arm, and not simply the use of electrical signals to sense and relay messages, was, for the Federal Circuit, the critical aspect of Valmont's structure that distinguished it from Reinke's device.²⁸²

This case thus illustrates how a specification can limit a means-plus-function claim element. Had Valmont contemplated alternative means of sensing and relaying signals to allow for guidance of its extension-arm sprinkler in its specification, a wider scope of protection would likely have been accorded to its patent.²⁸³ In addition, the case illustrates that a primary interpretative task performed by the Federal Circuit in construing means-plus-function claim elements is the proper assessment of the function recited in the claim.

The Federal Circuit quoted *Valmont* with approval in the post-*Markman* case, *Lockwood v. American Airlines, Inc.*²⁸⁴ In *Lockwood*, the plaintiff had asserted its patents covering a computerized system of tailoring sales presentations against American. Lockwood's claim at issue required, *inter alia*, that its systems have a means for "composing

279. *Id.*, 25 U.S.P.Q.2d (BNA) at 1455.

280. *See Valmont Indus., Inc. v. Reinke Mfg. Co.*, 14 U.S.P.Q.2d (BNA) 1374, 1380-83 (D. Neb. 1990), *rev'd*, 983 F.2d 1039, 25 U.S.P.Q.2d (BNA) 1451 (Fed. Cir. 1993).

281. *See Valmont*, 983 F.2d at 1044, 25 U.S.P.Q.2d (BNA) at 1456.

282. *See id.* at 1044-45, 25 U.S.P.Q.2d (BNA) at 1456.

283. *See id.* at 1044, 25 U.S.P.Q.2d (BNA) at 1456 (stating that, although Valmont's disclosed guidance structure in its patent specification and Reinke's actual guidance structure in its irrigation device both use electronic signals, "the structures generating those signals are strikingly different").

284. 107 F.3d 1565, 1576, 41 U.S.P.Q.2d (BNA) 1961, 1969 (Fed. Cir. 1997).

an individualized sales presentation.”²⁸⁵ The lower court found, and the Federal Circuit agreed, that “composing” as used in the claim did not encompass systems wherein photographs are manually selected and viewed from a generated list. Lockwood did not dispute that American’s system employed such manual selection.²⁸⁶ Affirming the lower court’s finding of no infringement, the Federal Circuit pointed out that insofar as American’s system “does not perform the functions required by the properly construed claims, e.g., it does not ‘compose’ an ‘individualized sales presentation’ within the meaning of the claims, there is no need to compare the structure of the accused device to the structure disclosed in the patent.”²⁸⁷

As *Lockwood* illustrates, once a means-plus-function claim element has been properly interpreted, infringement is then determined with respect to the *factual* questions of whether an accused device performs the function recited in the patentee’s claim, and whether the accused device’s structure is identical or equivalent.²⁸⁸

In reviewing a lower court’s assessment of equivalent structures under Section 112, paragraph 6, the Federal Circuit has accorded deference to extrinsic evidence such as expert testimony in reviewing such fact-based infringement findings.²⁸⁹ For example, in *Symbol Technologies, Inc. v. Opticon, Inc.*,²⁹⁰ expert testimony proffered by the patentee was dispositive in the Federal Circuit’s affirmation of the lower court’s finding of infringement.²⁹¹ Symbol Technologies claimed a laser-based, bar-coding scanner with a novel “aim and shoot” feature that enabled a user to scan bar codes without the need for making actual contact between the scanner and the bar code.²⁹² The “aim and shoot” feature was recited in the claims, in relevant part, as follows: “miniature optic means . . . to permit the user to conveniently register the laser light beam on the symbol [i.e., a

285. *Id.* at 1569, 41 U.S.P.Q.2d (BNA) at 1964.

286. *See id.* at 1576, 41 U.S.P.Q.2d (BNA) at 1969.

287. *Id.*, 41 U.S.P.Q.2d (BNA) at 1969 (quoting *Valmont* for the proposition that “[t]he accused device must . . . perform the identical function as specified in the claims”).

288. *See King Instrument Corp. v. Otari Corp.*, 767 F.2d 853, 862, 226 U.S.P.Q. (BNA) 402, 408 (Fed. Cir. 1985) (determining that question of whether accused process uses identical structures as those in patentee’s specification is a factual inquiry).

289. *See id.*, 226 U.S.P.Q. (BNA) at 408-09 (noting importance of expert testimony in determination of equivalents under section 112).

290. 935 F.2d 1569, 19 U.S.P.Q.2d (BNA) 1241 (Fed. Cir. 1991).

291. *See Symbol Techs., Inc. v. Opticon, Inc.*, 935 F.2d 1569, 1574-76, 19 U.S.P.Q.2d (BNA) 1241, 1244-46 (Fed. Cir. 1991) (holding that opinion testimony claiming patent infringement was admissible despite absence of factual foundation underlying testimony in accordance with Rule 705 of Federal Rules of Evidence).

292. *See id.* at 1572, 19 U.S.P.Q.2d (BNA) at 1243.

generic reference to 'bar code'] by sighting the symbol along a direct line of sight"²⁹³

Opticon produced a competing device, and Symbol sued for infringement.²⁹⁴ The case turned on the factual question of whether Opticon's device contained structures that were either identical or equivalent to the rather complex structures, disclosed in Symbol's specification, which performed the recited functions.²⁹⁵ Symbol offered expert testimony by a coinventor of Symbol's device.²⁹⁶ The coinventor introduced detailed charts and drawings, from which he opined that each claim limitation was met by a corresponding structure in Opticon's accused devices.²⁹⁷ The lower court found for Symbol.²⁹⁸ The Federal Circuit affirmed, reasoning that Symbol's expert testimony made out a prima facie case for infringement, which was not effectively rebutted through Opticon's cross-examination of Symbol's expert witness.²⁹⁹ Symbol had thus met its burden of proving infringement by a preponderance of the evidence. Clearly the shift from a question of law (interpreting the claim) to a question of fact (in identifying equivalents) worked in Symbol's favor.

C. Preamble Claim Terms

Terms in claim preambles are construed consistently with general principles of claim interpretation.³⁰⁰ However, the threshold question in interpreting claim preambles is whether the preamble constitutes a limitation at all. As a general rule, preamble terms do not constitute limitations when the body of the claim includes "a self-contained description of the structure [being claimed] not depending for completeness upon the introductory clause,"³⁰¹ or when "the preamble merely state[s] a purpose or intended use of [the] subject matter [recited in the body of the claim]."³⁰² By contrast, a preamble term will confer a limitation when the preamble term is "considered necessary to give life, meaning, and vitality" to the claim.³⁰³

293. *Id.*, 19 U.S.P.Q.2d (BNA) at 1243.

294. *See id.*, 19 U.S.P.Q.2d (BNA) at 1243.

295. *See id.* at 1574, 19 U.S.P.Q.2d (BNA) at 1245.

296. *See id.*, 19 U.S.P.Q.2d (BNA) at 1244.

297. *See id.*, 19 U.S.P.Q.2d (BNA) at 1244.

298. *See Symbol Techs., Inc. v. Opticon, Inc.*, 17 U.S.P.Q.2d (BNA) 1737, 1738 (S.D.N.Y. 1990), *aff'd*, 935 F.2d 1569, 19 U.S.P.Q.2d (BNA) 1241 (Fed. Cir. 1991).

299. *See Symbol Techs.*, 935 F.2d at 1574-76, 19 U.S.P.Q.2d (BNA) at 1244-46.

300. *See Bell Communications Research Inc. v. Vitalink Communications Corp.*, 55 F.3d 615, 620, 34 U.S.P.Q.2d (BNA) 1816, 1819 (Fed. Cir. 1995).

301. *Kropa v. Robie*, 187 F.2d 150, 152, 88 U.S.P.Q. (BNA) 478, 480 (C.C.P.A. 1951).

302. *Id.*, 88 U.S.P.Q. (BNA) at 481.

303. *See id.* at 152, 88 U.S.P.Q. (BNA) at 480-81.

However, despite the surface clarity of these rules, the Federal Circuit explained in *Corning Glass Works v. Sumitomo Electric U.S.A., Inc.*³⁰⁴ that:

No litmus test can be given with respect to when the introductory words of a claim, the preamble, constitute a statement of purpose for a device or are, in themselves, additional structural limitations of a claim. To say that a preamble is a limitation if it gives "meaning to the claim" may merely state the problem rather than lead one to the answer. The effect preamble language should be given can be resolved only on review of the entirety of the patent to gain an understanding of what the inventors actually invented and intended to encompass by the claim.³⁰⁵

The facts and analysis in *Corning Glass Works* reveal what the Federal Circuit looks for in assessing "what the inventors actually invented and intended to encompass by the claim."³⁰⁶ Corning's invention was directed to "optical waveguides" for use in communications systems.³⁰⁷ Corning's claim recited "an optical waveguide comprising" several elements.³⁰⁸ Sumitomo produced competing waveguides, and Corning sued for infringement.³⁰⁹ Sumitomo asserted as a defense that Corning's claim was invalid because it was anticipated by a prior art reference that contained all of the elements recited in the body of Corning's claim.³¹⁰ Corning contended that the preamble term "optical waveguide" constituted a limitation not met by the prior art reference (but met by Sumitomo's device).³¹¹

The case thus turned on the Federal Circuit's interpretation of the preamble. The Federal Circuit first noted that Corning had defined "optical waveguide" quite precisely in its specification as follows: "[T]ransmitting media [for frequencies around 10^{15} hz] are hereinafter referred to as 'optical waveguides.' . . . [A]n optical waveguide should allow only preselected modes of light to propagate along the fiber."³¹² The specification also contained information about the desired physical attributes of an "optical waveguide."³¹³ Moreover, Corning's specification made clear:

304. 868 F.2d 1251, 9 U.S.P.Q.2d (BNA) 1962 (Fed. Cir. 1989).

305. *Corning Glass Works v. Sumitomo Elec. U.S.A., Inc.*, 868 F.2d 1251, 1257, 9 U.S.P.Q.2d (BNA) 1962, 1966 (Fed. Cir. 1989).

306. *Id.*, 9 U.S.P.Q.2d (BNA) at 1966.

307. *See id.* at 1255, 9 U.S.P.Q.2d (BNA) at 1964.

308. *See id.* at 1256, 9 U.S.P.Q.2d (BNA) at 1965.

309. *See id.* at 1255, 9 U.S.P.Q.2d (BNA) at 1965.

310. *See id.* at 1255-56, 9 U.S.P.Q.2d (BNA) at 1965.

311. *See id.* at 1256-57, 9 U.S.P.Q.2d (BNA) at 1965-66.

312. *Id.* at 1256, 9 U.S.P.Q.2d (BNA) at 1965-66.

313. *Id.*, 9 U.S.P.Q.2d (BNA) at 1966.

that the inventors were working on the particular problem of an effective optical communication system not on general improvements in conventional optical fibers. To read the claim in light of the specification indiscriminantly to cover all types of optical fibers would be divorced from reality. The invention is restricted to those fibers that work as waveguides as defined in the specification, which is not true with respect to fibers constructed with the limitations [in the body of the claim] only.³¹⁴

Thus, the Federal Circuit concluded that the preamble of Corning's claim was essential to define the invention.³¹⁵ The Federal Circuit's interpretation of Corning's preamble had the effect of both preserving the validity of Corning's claim³¹⁶ and supporting a finding of infringement by Sumitomo.³¹⁷

A similar result ensued in the post-*Markman* case, *Rowe v. Dror*.³¹⁸ In an interference proceeding, Dror filed a motion for judgment against Rowe on the ground that some of Rowe's claims were anticipated by the prior art. The claims at issue were in Jepson format,³¹⁹ and recited the phrase "[i]n a balloon angioplasty catheter." The prior art taught a general purpose catheter, but did not specifically teach an angioplasty catheter.³²⁰ The PTO Board of Patent Appeals and Interferences found Rowe's claims anticipated and entered judgment against Rowe. Rowe appealed to the Federal Circuit.

At issue on appeal was whether the term "angioplasty" in the preamble of Rowe's claims conferred a limitation. Quoting *Corning Glass Works* for the proposition that "[t]he determination of whether preamble recitations are structural limitations or mere statements of purpose or use 'can be resolved only on review of the entirety of the patent . . .,'"³²¹ the court found that "angioplasty" indeed conferred a limitation that distinguished Rowe's claim over the prior art.³²²

314. *Id.* at 1257, 9 U.S.P.Q.2d (BNA) at 1966.

315. *See id.*, 9 U.S.P.Q.2d (BNA) at 1966.

316. *See id.*, 9 U.S.P.Q.2d (BNA) at 1966.

317. *See id.* at 1261, 9 U.S.P.Q.2d (BNA) at 1970.

318. 112 F.3d 473, 42 U.S.P.Q.2d (BNA) 1550 (Fed. Cir. 1997).

319. The Jepson format is conventionally used for improvement patents. Such claims generally contain a preamble that sets forth "elements or steps of the claimed invention which are conventional or known," followed by the body of the claim setting forth the improvement. *See* 37 C.F.R. § 1.75(e) (1997).

320. *See Rowe*, 112 F.3d at 479, 42 U.S.P.Q.2d (BNA) at 1555.

321. *Id.* at 478, 42 U.S.P.Q.2d (BNA) at 1553 (quoting *Corning Glass Works*, 868 F.2d at 1257, 9 U.S.P.Q.2d (BNA) at 1966).

322. *See id.* at 479, 42 U.S.P.Q.2d (BNA) at 1553-54.

The preamble of a claim may thus be critical. When drafting claims, applicants should take special care in evaluating the impact of terms placed in preambles.

D. Expansion of a Claim's Reach Under the Doctrine of Equivalents

1. The relationship between claim interpretation and the doctrine of equivalents

The foregoing discussion has focused on the strategies used by the Federal Circuit to construe the literal scope of a claim. However, a claim's reach can, in principle, be expanded somewhat to cover a "penumbra" of embodiments, which, while they do not fall within the literal scope of a claim, are nevertheless so similar to a patentee's claimed invention that for all intents and purposes they ought to be considered the same³²³ through operation of the judicially created "doctrine of equivalents."³²⁴ The doctrine of equivalents is designed to protect inventors from those who might otherwise "make unimportant and insubstantial changes and substitutions in . . . [a] patent which, though adding nothing, would be enough . . . [to evade] the reach of the law."³²⁵

Unlike claim interpretation questions, however, the relevant inquiry for a doctrine of equivalents infringement analysis consists of a *factual* determination of whether the differences between the claimed invention and accused product or process are insubstantial.³²⁶

323. See 5 DONALD S. CHISUM, CHISUM ON PATENTS § 18.03[1], at 18-27 (1997) (reproducing *Autogiro Co. of Am. v. United States*, 384 F.2d 391, 400, 155 U.S.P.Q. (BNA) 697, 704-05 (Ct. Cl. 1967), as a good example of the expansion of claim interpretation analysis from literal scope to the doctrine of equivalents).

324. *Id.* § 18.04, at 18-73.

325. *Hilton Davis Chem. Co. v. Warner-Jenkinson Co.*, 62 F.3d 1512, 1517, 35 U.S.P.Q.2d (BNA) 1641, 1644 (Fed. Cir. 1995) (in banc), *rev'd on other grounds*, 117 S. Ct. 1040 (1997) (per curiam) (quoting *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 607 (1950)).

326. See *id.* at 1520, 35 U.S.P.Q.2d (BNA) at 1647. A core test under the "insubstantial differences" standard is whether the accused product or process performs "substantially the same function in substantially the same way to give substantially the same result" as the claimed invention. See *Atlas Powder Co. v. E.I. Du Pont De Nemours & Co.*, 750 F.2d 1569, 1579, 224 U.S.P.Q. (BNA) 409, 416 (Fed. Cir. 1984).

For an example of this doctrine in practice, see *Hilton Davis*, 63 F.3d at 1520, 35 U.S.P.Q.2d (BNA) at 1647. *Hilton Davis* claimed a novel process for purifying dyes. See *id.* at 1515, 35 U.S.P.Q.2d (BNA) at 1643. *Warner-Jenkinson* used a similar process for purifying dyes. See *id.* at 1516, 35 U.S.P.Q.2d (BNA) at 1643. In a suit brought by *Hilton Davis*, a district court jury found for *Hilton Davis* on the ground that *Warner-Jenkinson* infringed *Hilton Davis'* claim under the doctrine of equivalents. In doing so, the court found that *Warner-Jenkinson's* process functioned in substantially the same way to achieve substantially the same result. See *id.* at 1524, 35 U.S.P.Q.2d (BNA) at 1650-57. The Federal Circuit affirmed the district court's holding on the ground that there was substantial evidence to justify the jury's finding of fact. See *id.* at 1523-25, 35 U.S.P.Q.2d (BNA) at 1650-51. The Supreme Court reversed, however, on the ground that *Hilton Davis* had not provided a reason why its claim had a lower pH limit of 6-0, and therefore

Insubstantial differences may be found on the basis of criteria such as extrinsic evidence of functional equivalency, and such findings are reviewed by the Federal Circuit for clear error.³²⁷

The doctrine of equivalents thus represents a separate and distinct inquiry that is independent of claim interpretation *per se*.³²⁸ A narrow interpretation of a claim term will not necessarily preclude invocation of the doctrine. For example, as discussed above,³²⁹ the Federal Circuit in *Pall Corp. v. Micron Separations Inc.*,³³⁰ reversed a finding of literal infringement based on its interpretation of the literal scope afforded by the claim term "about."³³¹ Nevertheless, the court affirmed a finding of infringement under the doctrine of equivalents.³³² The rationale for affirmance, however, resided not in an expansion of claim scope under the doctrine on the basis of the recitation of the claim term "about," but rather in the factual record showing equivalency of nylon material having a ratio of 4:1 with nylon material having a ratio in the claimed range of "about 5:1 to about 7:1."³³³

2. *Unforeseen embodiments*

As was the case for literal infringement under the Federal Circuit's decision in *Phillips Petroleum*,³³⁴ discussed above,³³⁵ the doctrine of equivalents can likewise enable a patentee to enforce its patent against later improvements, unforeseen at the time the patentee filed the application.³³⁶ The case of *Hughes Aircraft Co. v. United States*³³⁷

might be estopped to assert the doctrine of equivalents to ensure processes rising pH's lowers than 6-0.

327. See *id.* at 1520, 35 U.S.P.Q.2d (BNA) at 1646-47. Other factors, such as the known interchangeability of ingredients, may buttress a finding of infringement under the doctrine. See *id.* at 1519, 35 U.S.P.Q.2d (BNA) at 1646.

328. See *Pall Corp. v. Micron Separations, Inc.*, 66 F.3d 1211, 1216, 1218, 36 U.S.P.Q.2d (BNA) 1225, 1228-29 (Fed. Cir. 1995) (describing claim interpretation as a question of law and infringement by equivalency as a question of fact).

329. See *supra* notes 142-43 and accompanying text.

330. 66 F.3d 1211, 36 U.S.P.Q.2d (BNA) 1225 (Fed. Cir. 1995).

331. *Pall Corp. v. Micron Separations, Inc.*, 66 F.3d 1211, 1218, 36 U.S.P.Q.2d (BNA) 1225, 1229 (Fed. Cir. 1995).

332. See *id.* at 1220, 36 U.S.P.Q.2d (BNA) at 1231.

333. *Id.*, 36 U.S.P.Q.2d (BNA) at 1231.

334. See *United States Steel Corp. v. Phillips Petroleum Co.*, 865 F.2d 1247, 9 U.S.P.Q.2d (BNA) 1461 (Fed. Cir. 1989).

335. See *supra* notes 125-38 and accompanying text.

336. See *Pall*, 66 F.3d at 1220, 36 U.S.P.Q.2d (BNA) at 1231 (finding that nylon 46 membranes not commercially available at the time of *Pall's* invention and therefore not included in *Pall's* experimentation with nylon 66 infringed on *Pall's* patent by virtue of nylon 66's similarity in chemical structure and function to *Pall's* claimed nylon 46); *Phillips Petroleum*, 865 F.2d at 1252, 9 U.S.P.Q.2d (BNA) at 1465 (finding that the definition of terms can change over time as the relevant art changes).

337. 717 F.2d 1351, 219 U.S.P.Q. (BNA) 473 (Fed. Cir. 1983).

demonstrates the doctrine's power in this regard. Hughes designed a novel communications satellite that could hover at a fixed point above the earth.³³⁸ Hughes' satellite filled a long-standing need in the art,³³⁹ and represented a practical solution to the previously insoluble technical problem of providing a satellite with "attitude control"—the ability to properly orient the satellite in space at will.³⁴⁰ Hughes' system could control a satellite's orientation by relaying signals from the ground to the satellite.³⁴¹ The ground-based signals would cause jets on the satellite to fire pulses at selected satellite positions for selected periods of time.³⁴²

Hughes' claims were drafted in means-plus-function format.³⁴³ A central issue in the case concerned the following claim limitations:

- e. means disposed on said body for providing an indication to a location external to said body of the instantaneous . . . position of said body . . .
- f. and means disposed on said body for receiving from said location control signals synchronized with said indication.³⁴⁴

The claim's limitations, as well as the structures described in Hughes' specification for fulfilling the functions recited in the claim, consisted only of bodies (satellites, as described in the specification) that dispatched and received external signals to and from the ground.³⁴⁵

The U.S. government subsequently began to manufacture or use communications satellites having "attitude control," and Hughes sued the government for patent infringement.³⁴⁶ The government

338. *See Hughes Aircraft Co. v. United States*, 717 F.2d 1351, 1353, 219 U.S.P.Q. (BNA) 473, 474 (Fed. Cir. 1983). The advantages of such a satellite that both Hughes and the U.S. Government sought were the abilities to keep the directional antennae pointed toward the earth and to keep the solar cells in the exposure of the sun at all times. This system would ensure constant communications and a reliable power supply. *See id.*, 219 U.S.P.Q. (BNA) at 474-75.

339. *See id.* at 1352, 219 U.S.P.Q. (BNA) at 474. The U.S. Department of Defense and the National Aeronautics and Space Administration aggressively pursued the technology to enable deployment of a synchronus communications satellite, though neither entity was successful in its efforts despite large monetary expenditures. *See id.*, 219 U.S.P.Q.2d (BNA) at 474.

340. *See id.* at 1353, 219 U.S.P.Q. (BNA) at 474-75.

341. *See id.*, 219 U.S.P.Q. (BNA) at 474-76. The satellite could also constantly transmit positional information to earth based on its sun sensor. *See id.*, 219 U.S.P.Q.2d (BNA) at 474. This information allowed the ground crew to monitor its location and direction at all times. *See id.*, 219 U.S.P.Q. (BNA) at 474.

342. *See id.*, 219 U.S.P.Q. (BNA) at 475. The movement of the satellite was accomplished through pulse bursts of gas known as "precessing." *Id.*, 219 U.S.P.Q. (BNA) at 476.

343. *See id.* at 1355, 219 U.S.P.Q. (BNA) at 476.

344. *Id.*, 219 U.S.P.Q. (BNA) at 476.

345. *See id.* at 1354, 219 U.S.P.Q. (BNA) at 475 (indicating that the examiner rejected inclusion of ground control apparatus in patent application because of insufficient information).

346. *See id.* at 1356, 219 U.S.P.Q. (BNA) at 476 (outlining plaintiff's claim, after patent issuance, that Government employed Hughes' claimed invention in the SKYNET II, NATO II, DSCD II, IMP (H and J), SOLRAD (9 and 10), and PIONEER (10 and 11) spacecrafts).

contended that its satellites did not infringe Hughes' patent because Hughes' claims required the relay of signals to a satellite from an external location, whereas the government's satellites employed a "store and execute" control system.³⁴⁷ In such a system, instructions for when jets should fire, and for how long, were stored in a computer program on board the satellites, and were later executed to cause the jets to fire at the preprogrammed intervals.³⁴⁸ Accordingly, the government argued that its satellites did not employ a system requiring relay of signals from an external location, and therefore could not infringe Hughes' patent.³⁴⁹ The district court agreed with the government's arguments, on the ground that a claim limitation was clearly missing from the government's accused satellites, and thus infringement could not lie, either literally or under the doctrine of equivalents.³⁵⁰

The Federal Circuit reversed.³⁵¹ The court agreed that there was no literal infringement, but nevertheless found infringement under the doctrine of equivalents.³⁵² The Federal Circuit reasoned that the principle difference between Hughes' claimed satellite and the government's accused satellites was the presence in the government's satellites of an on-board computer that performed the functions accomplished by Hughes' ground-based system.³⁵³ In the words of the court:

The [government's] spacecraft are identical with the [Hughes] satellite, except for the employment of sophisticated, post-[Hughes' invention] equipment (computers) to achieve attitude control in the same basic manner taught by [Hughes]. Advanced computers

347. *See id.* at 1360-61, 219 U.S.P.Q. (BNA) at 480 (elaborating on the differences between Hughes' satellite and "store or execute," or S/E, spacecraft with respect to locational and navigational technology).

348. *See id.*, 219 U.S.P.Q. (BNA) at 480.

349. *See id.* at 1365, 219 U.S.P.Q. (BNA) at 483 (commenting that if S/E spacecraft sent signals to ground crews Hughes would have a clear claim for literal infringement).

350. *See id.* at 1358, 219 U.S.P.Q. (BNA) at 477-78 (announcing the trial judges' decision on remand from the U.S. Court of Claims). With respect to the claims, the trial judge found an absence of literal infringement based on the different control schemes—on-board versus external control. The trial judge found, further, that the S/E spacecraft did not infringe under the doctrine of equivalents its position signal or preprocessing technologies. *See id.*, 219 U.S.P.Q. (BNA) at 477-78.

351. *See id.* at 1366, 219 U.S.P.Q. (BNA) at 484 (finding an infringement of Hughes' claims, reversing the lower court's ruling, but affirming the lower court's finding of claim validity).

352. *See id.*, 219 U.S.P.Q. (BNA) at 484 ("The S/E spacecraft and the claimed Williams satellite . . . perform the same function . . . in substantially the same way . . . to obtain substantially the same result . . . Accordingly, we hold that Hughes has proven that the government's S/E spacecraft infringes Williams' claims . . . under the doctrine of equivalents.").

353. *See id.*, 219 U.S.P.Q. (BNA) at 484 (finding no differences between the satellite's and S/E spacecraft's basic manner of operation other than the location of where navigational tasks are performed).

and digital communications techniques developed since [Hughes' invention] permit doing on-board a *part* of what [Hughes] taught as done on the ground. As one of our predecessor courts, the Court of Claims, has thrice made clear, that partial variation in technique, an embellishment made possible by post-[Hughes' invention] technology, does not allow the accused spacecraft to escape the "web of infringement."³⁵⁴

The *Hughes* case thus teaches that a patentee will be protected from having its patent rendered effectively worthless by unforeseen improvements in the art that not only accomplish substantially the same thing as the patentee's invention, but in fact may well have been prompted by the patentee's disclosure.³⁵⁵ The decision in *Hughes* is consistent with the policy set forth in *Phillips Petroleum*, and was, in essence, reaffirmed in the Supreme Court's recent statement in its *Hilton Davis* decision that equivalents are to be assessed at the time of infringement.³⁵⁶

CONCLUSION

An understanding of how U.S. courts interpret patent claims is critical to ensure the effective drafting of claims during patent prosecution and for effective argument during litigation. The foregoing discussion has provided an overview of the Federal Circuit's claim interpretation processes in the pre- and post-*Markman* eras in an effort to help patent practitioners in both of these areas. Although post-*Markman* claim interpretation presents new challenges, it is hoped that the digests presented here demonstrate that interpretative arguments from intrinsic evidence are not a new phenomenon, that pre-*Markman* decisions by the Federal Circuit can provide useful guidance as to how the court will likely interpret claims from intrinsic evidence in the future, and that the current interpretative era still presents opportunities for presentation of extrinsic evidence in the form of expert testimony in appropriate circumstances.

354. *Id.* at 1365, 219 U.S.P.Q. (BNA) at 483.

355. It is important to note, however, that the subsequent improvement may itself be entitled to a patent, even if the improvement will infringe an earlier patent.

356. See *Hilton Davis Chem. Co. v. Warner-Jenkinson Co.*, 62 F.3d 1512, 1517, 35 U.S.P.Q.2d (BNA) 1641, 1644 (Fed Cir. 1995) (in banc), *rev'd on other grounds*, 117 S. Ct. 1040 (1997) (per curiam). The final outcome of the *Hughes* case remains in doubt, as the Supreme Court has remanded the matter to the Federal Circuit for re-evaluation of the claims under *Hilton Davis*. See *United States v. Hughes Aircraft Co.*, 117 S. Ct. 1466 (1997).

