ARTICLES

PATENT SYMMETRY

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The patent system suggests a natural symmetry: if "nonobvious" changes are enough to distinguish a patentable invention from the prior art, then further "nonobvious" changes should be enough to avoid infringing the patent. Logical as this seems, the courts have adopted the notoriously difficult standard of "insubstantial differences," rather than nonobviousness, as the ultimate test of infringement. In this Article, I consider the possibility of a genuinely symmetrical patent system and find the difficulties profound.

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However, I conclude that a semi-symmetrical adaptation of the nonobviousness standard of patentability could provide a superior infringement analysis – an analysis more objective in application and more consistent with the economic framework of patent doctrine.

INTRODUCTION

A cherished dream in the physical sciences is the discovery of a Grand Unified Theory – a common framework that connects, simplifies, and explains what had been perplexing and seemingly unrelated phenomena. In patent law, the field of law that most naturally commends itself to scientists, there are two perplexing and doctrinally separate phenomena – obviousness and equivalence – whose similarities cry out for a common approach, and perhaps for a unified theory.[1]

Obviousness is the key to defining what is a patentable invention. Even if an invention is new, only if it would have been *non*obvious to a person of ordinary skill in the art at the time the invention was made is it considered worthy of a patent monopoly.[2] Should the patent be obtained, equivalence is the ultimate measure of its effective scope. The carefully worded claims with which a patent concludes define the subject matter that literally infringes the patent, but courts have long held that equivalents exhibiting only minor differences are also proscribed.[3] Obviousness is a snare for the patentee; equivalence is the bane of an accused infringer. Yet the two concepts have much in common. Each extends around a more definite entity a ghostly penumbra of legal significance. Obviousness expands the obstacles to patentability posed by the disclosures of the prior art; equivalence broadens the reach of the patent beyond what the patentee explicitly claimed. The concepts are, in fact, so conceptually similar that students newly introduced to patent law often confuse the vocabulary, arguing that a patent should be held invalid because the prior art was "equivalent," or that infringement should be found where only "obvious" differences distinguish the accused product from the claimed invention. The courts, however, have preserved the distinction. A product infringes by equivalence, they say, not because it is an obvious variation of the claimed invention, but because the differences are "insubstantial."[4]

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[1] A. Samuel Oddi, *Un-Unified Economic Theories of Patents – the Not-Quite-Holy Grail*, 71 NOTRE DAME L. REV. 267, 268 (1996) (comparing attempts to draft an economic theory of patent law to the quest for "a unifying scientific theory of the universe"). As his title implies, Oddi finds that none of the theories yet proposed adequately accounts for all aspects of patent doctrine. *Id.* at 271.

[2] 35 U.S.C. § 103 (2000) (stating that a patent may not be obtained for obvious changes made to prior art); *see infra* Part I.B (discussing extensively the modern standard of nonobviousness).

[3] *See infra* Part I.C (discussing extensively the doctrine of equivalents).

[4] Toro Co. v. White Consol. Indus., Inc., 266 F.3d 1367, 1370 (Fed. Cir. 2001).

Obviousness is a difficult issue to resolve. It requires one to imagine how a claimed invention might have looked to a different person (the hypothetical person of ordinary skill in the art) at a different time (the time the invention was made), and without resorting to hindsight based on knowledge of the claimed invention (the very invention that is foremost in one's mind). Yet these difficulties are, in some respects, less severe than those posed by the "insubstantial differences" test of equivalence. To ask if a difference is "insubstantial" simply rephrases the question.[5] The analysis also lacks the objective considerations – such as commercial success and the failure of others – that assist in the obviousness inquiry.[6] The inadequacy of the formula, and the uncertainty of the result, is one of the reasons that the doctrine of equivalents has been, for more than 150 years, one of the most controversial aspects of patent doctrine.

The architect of a unified system would be tempted to re-imagine equivalence, if equivalence there must be, as a symmetrical manifestation of the obviousness principle. In other words, looking backwards in time from the date of the invention, what the applicant has added to the prior art must be nonobvious in order to be patentable; looking forward in time, what the accused infringer adds to the claimed invention must be nonobvious in order to avoid infringement. This solution is formally elegant. But it substitutes a difficult equivalence test for one that is, in many respects, hopeless. The idea is not so preposterous that others have failed to propose it.[7] However, there are

[5] *See* Warner-Jenkinson Co. v. Hilton Davis Chem. Co., 520 U.S. 17, 40 (1997) ("[T]he insubstantial differences test offers little additional guidance [beyond equivalence itself] as to what might render any given difference 'insubstantial.'").

[6] Whether *A* is known, to persons skilled in the art, as a substitute for *B* is said to be one objective factor leading to a conclusion that *A* and *B* are substantially the same. *See* Graver Tank & Mfg. Co. v. Linde Air Prods. Co., 339 U.S. 605, 609 (1950); *see also infra* Part I.C.2 (discussing the decision and analysis of *Graver* in further detail, including whether this factor really illuminates the substantiality of the differences between two patents).

[7] *See, e.g.*, Qing Lin, *A Proposed Test for Applying the Doctrine of Equivalents to Biotechnology Inventions: The Nonobviousness Test*, 74 WASH. L. REV. 885, 906-07 (1999) (recommending a two-prong approach to determining equivalence where the first prong examines whether the accused item was obvious from prior art or surrendered during patent prosecution and the second prong examines whether the modification made to the patented item is obvious); Michael T. Siekman, *The Expanded Hypothetical Claim Test: A Better Test for Infringement for Biotechnology Patents Under the Doctrine of Equivalents*, 2 B.U. J. SCI. & TECH. L. 6, 10 (1996) (suggesting that an "interchangeability" test is as valid as the "tripartite" and "substantial differences" tests, but avoids the problems posed by the latter two); Toshiko Takenaka, *Doctrine of Equivalents After* Hilton Davis*: A Comparative Law Analysis*, 22 RUTGERS COMPUTER & TECH. L.J. 479, 482 (1996) ("This Article also contends that the test for infringement under the doctrine of equivalents should parallel the standard for nonobviousness."); Roy H. Wepner, *The Patent Invalidity/Infringement Parallel: Symmetry or Semantics?*, 93 DICK. L. REV. 67, 80 (1988) ("The standards that govern the decision to grant (or invalidate) a patent should be, to the extent possible, parallel to the standards that define what constitutes an infringement."); Joseph S. Cianfrani, Note, *An*

at least two considerations that complicate the adoption of an obviousness standard of infringement – two asymmetries that may account, to some degree, for the failure of the courts to give the idea more than passing consideration.[8] If obviousness and equivalence are ever to be united in a common framework, these difficulties must be confronted.

One difficulty is that the baseline for the obviousness determination is, in the validity context, the disclosures or teachings of the prior art in its entirety. In an infringement inquiry, the baseline for comparison must be the patented invention. Even if one were to pay little heed to the principle of claim-based patenting in the context of equivalence, it would be necessary to anchor the infringement inquiry to the patentee's contribution to the art. In other words, one could not condemn all obvious products as infringing in the way that one can dismiss all obvious claims as unpatentable; the accused product would have to be obvious in a way that connected it specifically to the claimed invention. Conversely, some non-obvious differences in the accused product, including differences unrelated to the patented invention, should be ignored in an infringement determination. An equivalence test based on obviousness would have to account for this.

The more serious difficulty is that in a validity context, obviousness is judged from a fixed moment in time – the time the invention was made. Infringement, however, can occur at any time during the term of the patent, and in recent years the courts have increasingly analyzed equivalence in the

Economic Analysis of the Doctrine of Equivalents, 1 VA. J.L. & TECH. 1, ¶ 53 (1997), http://www.vjolt.net/vol1/issue/vol1_art1.pdf (discussing, without enthusiasm, an obviousness measure of equivalence); Stephen G. Kalinchak, Comment, *Obviousness and the Doctrine of Equivalents in Patent Law: Striving for Objective Criteria*, 43 CATH. U. L. REV. 577, 582 (1994) (suggesting parallels between obviousness and equivalence and advocating increased emphasis on objective considerations for the latter).

[8] *See* Lewmar Marine, Inc. v. Barient, Inc., 827 F.2d 744, 748 (Fed. Cir. 1987) (remarking that, as literal infringement mirrors anticipation, infringement under the doctrine of equivalents "is somewhat akin to obviousness"). Judge Lourie, concurring in *Johnson & Johnston Assocs. Inc. v. R.E. Serv. Co.*, 285 F.3d 1046, 1063 (Fed. Cir. 2002) (en banc), observed that "[a] patentee seeking to establish equivalence wants to show that the accused is merely making a minor variation of his invention, an obvious one, not a nonobvious improvement." In contrast, "[o]ne accused of infringement wants to show that he has made an important advance, not that he is a copier, and that his device was obvious over the patented invention, or foreseeable." *Id.* The function/way/result test of equivalence is, said Judge Lourie, "a test that is closer to obviousness [than] nonobviousness." *Id.* Judge Lourie was responding to the suggestion of Judge Rader, in his own concurring opinion, that equivalents should be limited to what the patentee could not have foreseen when drafting the claims. *See infra* note 199 and accompanying text. In her concurring opinion in *Roton Barrier, Inc. v. Stanley Works*, 79 F.3d 1112, 1128 (Fed. Cir. 1996), Judge Nies proposed more explicitly adopting a nonobviousness test for infringement. *See also infra* note 215 and accompanying text. The court has not, so far, adopted her suggestion.

context of ever-evolving technologies.[9] Indeed, one of the strongest justifications for the doctrine of equivalents is the inability of patentees to foresee, when drafting their claims, how the art will later develop. If equivalence were decided by an obviousness standard, two temporal perspectives suggest themselves: the time the patent application was filed,[10] or the time the alleged infringement occurred. The former would freeze the patent in time, depriving the patentee of rights against later-discovered equivalents. The latter poses problems as well. As each non-obvious product is introduced it becomes itself a part of the knowledge subsequently available to those skilled in the art. The next party to adopt the same (formerly non-infringing, but now obvious) variation would not enjoy the protections of the first. The result would be to give the party who introduced the non-obvious variation patent-like advantages over its competitors, even if it did not, or could not, have obtained a patent.

At the cost of some doctrinal asymmetry, it is possible to formulate a hybrid test of equivalence that preserves the benefits of an obviousness-based inquiry, anchors the inquiry to the claimed invention, and avoids the worst consequences of the temporal anomalies described above. The test I will propose is this: the accused combination is equivalent to the claimed combination if, at the time the patent application was filed, a person of ordinary skill in the art, aware of both the claimed combination *and the*

[9] *See, e.g.*, Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 731 (2002) ("'Often the invention is novel and words do not exist to describe it. The dictionary does not always keep abreast of the inventor.'" (quoting Autogiro Co. of Am. v. United States, 384 F.2d 391, 397 (Ct. Cl. 1967))); Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus., Inc., 145 F.3d 1303, 1310 (Fed. Cir. 1998) ("The doctrine of equivalents is necessary because one cannot predict the future. . . . [A] variant of an invention may be developed after the patent is granted, and that variant may constitute so insubstantial a change from what is claimed in the patent that it should be held to be an infringement."); *see also* Christopher A. Cotropia, *"After-Arising" Technologies and Tailoring Patent Scope*, 61 N.Y.U. ANN. SURV. AM. L. 151, 161 (2005) ("As of late, the emphasis on the doctrine of equivalents has focused on protecting one specific type of equivalent termed an 'after-arising equivalent.'").

[10] One could also adopt the perspective of the time when the patented invention was made. This would most closely mirror the obviousness standard. *See* 35 U.S.C. § 103 (2000). However, the time of filing perspective would match the usual practice for claim interpretation, enablement, and other standards related to the information communicated by the patent to persons skilled in the art. *See* Plant Genetic Sys., N.V. v. Dekalb Genetics Corp., 315 F.3d 1335, 1339 (Fed. Cir. 2003) (establishing the temporal perspective to be applied in enablement inquiries); Kopykake Enters., Inc. v. Lucks Co., 264 F.3d 1377, 1383 (Fed. Cir. 2001) (establishing the temporal perspective to be used in claim interpretation for literal infringement); Mark A. Lemley, *The Changing Meaning of Patent Claim Terms*, 104 MICH. L. REV. 101, 116 (2005) (advocating the time of filing as the best alternative for interpreting the meaning of claim terminology). In any event, adopting the perspective of the time when the invention was made, and the perspective of the time when the patent application was filed, present similar difficulties.

substituted element, would have found it obvious to make the substitution. This test will not satisfy those who bridle at the notion of equivalence in general. Arguably, it takes us even further from the ideal situation in which the scope of a patent is measured by the language of its claims. It would, however, be a step toward a unified system of patent law, and it would add substance and objectivity to the equivalence determination, something the courts have generally failed to accomplish.

Part I of this Article lays the groundwork for discussion by summarizing the principles of nonobviousness and infringement by equivalence. Part II examines the difficulties posed by adopting an obviousness standard of equivalence, and how the proposed test addresses those difficulties. Part III concludes with an analysis of the potential advantages of a symmetrical and obviousness-based system of patent law, including its compatibility with the leading economic theories of how patents promote innovation while minimizing its costs.

I. OBVIOUSNESS AND EQUIVALENCE

The goal of the patent system, as expressed in Article I, Section 8 of the United States Constitution, is to "promote the Progress of . . . [the] useful Arts."[11] Today we might say that the goal is to promote the advancement of technology.[12] One who discovers a new process, machine, manufacture or composition of matter enjoys, during the term of the patent, the right to exclude others from making, using, selling, offering to sell, or importing into the United States the invention that is the subject of the patent.[13] This exclusive right allows inventors to recoup their costs and to capture at least some of the value of their contribution to society. While this tends to give inventors their just deserts, most would agree that the primary beneficiary of the patent system is the public. If others had perfect freedom to compete with the inventor by duplicating and selling the invention, the rewards of inventive activity might be too small to justify the costs, and society would be denied the benefits of technological advancement.[14]

Society, acting through government, could encourage invention directly by awarding cash prizes for significant technological advancements. Some might prefer that system.[15] But the patent system has the advantage of being, in a

[11] U.S. CONST. art. I, § 8, cl. 8.

[12] *See* Alan L. Durham, *"Useful Arts" in the Information Age*, 1999 BYU L. REV. 1419, 1437-44 (tracing the various courts and scholars who have suggested that modern-day "useful arts" are equal to "technological arts") .

[13] 35 U.S.C. §§ 101, 271(a) (2000).

[14] *See* Cotropia, *supra* note 9, at 169-70.

[15] *See* Steven Shavell & Tanguy Van Ypersele, *Rewards Versus Intellectual Property Rights*, 44 J.L. & ECON. 525, 530 (2001) ("Under the reward system, the incentive to invest is governed by the reward and thus is not systematically inadequate; yet the incentive to invest is not linked to actual surplus but only to the reward.").

sense, self-regulating. It is unnecessary to convene a panel of experts to attempt to determine, perhaps in advance of its full commercial exploitation, whether a particular invention merits a large prize, a small prize, or no prize at all. Instead, the marketplace measures the reward secured by a patented invention. An important invention, for which there are few alternatives, will command a high price if the inventor is the only seller. If others wish to make or sell the invention, and the inventor for efficiency's sake finds it desirable to let them, the price of a license will be correspondingly high. If, on the other hand, the advancement is a minor one – one for which there are ready substitutes, or which can be dispensed with entirely – the rewards will be correspondingly small. Because the incentives are directed where the advancements are, from the perspective of the marketplace, most significant, the system seems well-calculated to promote the progress of technology, and in a relatively efficient manner.

On the other hand, Americans have long mistrusted monopolies, however justified. This instinctive hostility led even Thomas Jefferson, the man most closely associated with the founding of the United States patent system, to question whether monopolies should be tolerated under any circumstances.[16] As economists studying the field of antitrust well know, if one firm is the sole supplier of a product for which there is no easy substitute, that firm will maximize its profits by producing less of the product than would be produced in a competitive marketplace while charging a higher price.[17] This not only reduces consumer surplus – the difference between the benefit that a product confers on consumers and the price they have to pay – it also generates "deadweight loss." Deadweight loss occurs when some consumers who desire the product, and who could pay the costs of its production, have to forego purchasing the product at the monopolist's higher price.[18] Allocative inefficiency results as society's resources are misdirected toward less desired alternatives.[19] Assuming that a patented invention is one that does matter in the marketplace, (i.e., it is a product for which there is unique consumer demand), these unfortunate effects will occur. Hence a successful patent system is one in which the public benefit created by encouraging technological advancement more than compensates for the price paid as a consequence of the patentee's monopoly.[20]

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[16] Graham v. John Deere Co., 383 U.S. 1, 7-8 (1966) (detailing Jefferson's reservations regarding the monopolies granted under the patent system).

[17] *See* RICHARD A. POSNER, ANTITRUST LAW 12 (2d ed. 2001) ("[W]e now know that output is smaller under monopoly than under competition."); *see also* HERBERT HOVENKAMP, FEDERAL ANTITRUST POLICY § 1.2(a) (3d ed. 2005) ("[T]he monopolist, unlike the competitor, can obtain a higher price per unit of output by producing less.").

[18] *See* HOVENKAMP, *supra* note 17, §§ 1.1, 1.3(b).

[19] *See id.* § 2.3(c).

[20] *See* Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, 996-97 (1997) (discussing the costs and benefits associated with a patent

A. *The "Flash of Genius"*

One way of adjusting the balance is by ensuring that patents are awarded only to inventions of a certain quality – advancements, in Jefferson's phrase, "worth to the public the embarrassment of an exclusive patent."[21] Patents for some trivial inventions could be ignored in the marketplace with no harm done, but serious consequences would ensue if, for example, a patent were granted on an important product already invented by someone else. The patentee, in that case, would take from the public while giving nothing in return. The patent laws guard against this by denying patents to inventions that lack novelty in comparison to various forms of "prior art" – including earlier inventions in physical form and the disclosures of prior patents and publications.[22] Yet to require that a patented invention be *new* is not quite enough; if a patent claims something that differs from the prior art in an insignificant way, the public will be limited in its freedoms, and deprived of its funds, with little if any technological advancement to justify it. Suppose that someone, observing the success of 3M's yellow Post-It Notes, had patented the same item in a shade of blue. Even if neither 3M nor anyone else had yet marketed a blue Post-It Note, it would be difficult to show how society benefited by allowing the latecomer to corner whatever market there might be for blue Post-It Notes. If such patents were allowed, successful products would soon be surrounded by a thicket of opportunistic monopolies, claiming the equivalent of pink Post-It Notes, square Post-It Notes, recycled-paper Post-It Notes, and so forth.

Prior to the 1952 Patent Act, the level of advancement necessary to secure a patent had been expressed by the courts in various terms, all grounded in the necessity that a patent secure rights to an "invention."[23] The leading case of the nineteenth century is *Hotchkiss v. Greenwood*,[24] where the patentee claimed a clay or porcelain door knob secured in a certain fashion to a screw.[25] Similar knobs, made of metal or wood, were already well-known; the only thing that distinguished the patentee's version was the substitution of a different material.[26] Although this might produce a better or cheaper knob, it failed to rise to the level of a patentable invention: "The difference is formal, and destitute of ingenuity or invention. It may afford evidence of judgment

system). For a discussion of attempts to explain the patent system through economic theory, see *infra* Part III.D.

[21] *See Graham*, 383 U.S. at 9.

[22] 35 U.S.C. § 102 (2000) (listing the varieties of relevant prior art).

[23] *See Graham*, 383 U.S. at 14 (explaining that prior to the Patent Act, the term "invention" was used).

[24] 52 U.S. (11 How.) 248 (1850).

[25] *Id.* at 248-49 ("They have invented a new and useful improvement in making door and other knobs, of all kinds of clay used in pottery, and of porcelain, which they state has not been known or used before their application.").

[26] *Id.* at 265.

and skill in the selection and adaptation of materials . . . but nothing more."[27] A true "invention" requires more "ingenuity and skill" than that possessed by "an ordinary mechanic acquainted with the business."[28] The work of even a "skilful mechanic" is "not that of [an] inventor,"[29] and cannot be the subject of a patent.

The *Hotchkiss* standard of "invention" persisted, and in 1941, in *Cuno Engineering Corp. v. Automatic Devices Corp.*,[30] the Supreme Court used it to invalidate a patent to an automobile cigarette lighter.[31] The lighter included a thermostat to interrupt the electrical circuit automatically when the heating element reached the necessary temperature.[32] Such controls had been used before – in toasters and the like – but never in this context.[33] The court did not deny that the inventor had produced "a more efficient, useful, and convenient article,"[34] but the ingenuity required to adapt a well-known thermostat to a new use was only "that to be expected of a mechanic skilled in the art."[35] In order to qualify as an "invention" under the patent laws, a new device, the court held, "must reveal the flash of creative genius, not merely the skill of the calling."[36]

This reference to "creative genius" is the rhetorical high point in the Supreme Court's campaign for a demanding test of inventiveness, without which patentees might lay "the heavy hand of tribute . . . on each slight technological advance in an art."[37] Quoting the stirring words of Justice Bradley in *Atlantic Works v. Brady*,[38] the Court portrayed the consequences of a system that grants patents too freely:

> Such an indiscriminate creation of exclusive privileges tends rather to obstruct than to stimulate invention. It creates a class of speculative schemers who make it their business to watch the advancing wave of improvement, and gather its foam in the form of patented monopolies, which enable them to lay a heavy tax upon the industry of the country, without contributing anything to the real advancement of the arts. It embarrasses the honest pursuit of business with fears and apprehensions

[27] *Id.* at 266.
[28] *Id.* at 267.
[29] *Id.*
[30] 314 U.S. 84 (1941).
[31] *Id.* at 88.
[32] *Id.*
[33] *Id.* at 88-89.
[34] *Id.* at 91.
[35] *Id.* at 91-92.
[36] *Id.* at 91.
[37] *Id.* at 92.
[38] 107 U.S. 192 (1882).

> of concealed liens and unknown liabilities to lawsuits and vexatious accountings for profits made in good faith.[39]

The court was undoubtedly correct that the encouragement of inventive activity depends upon a judicious balancing of incentives. Monopoly privileges cannot be granted indiscriminately. But in evoking the romantic idea of "genius" – transmitted in a promethean "flash" no less – the Court may have raised the bar of patentability too high. Some worthy inventions are the products of patience and industry, not the kind of super-human insight suggested by "genius."[40]

B. *The Modern Standard of Nonobviousness*

In the 1952 Patent Act, Congress, for the first time, attempted to define by statute the level of ingenuity necessary to justify a patent. Reflecting the Supreme Court precedent, a patentable invention must still surpass the skills that are common in the art.[41] Now, though, the yardstick is nonobviousness. Section 103 states that a patent cannot be obtained:

> [I]f the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.[42]

The "ordinary skilled mechanic," now re-christened the "person having ordinary skill in the art," has been described as a bit of a plodder – someone "who thinks along the line of conventional wisdom" and who does not seek to innovate.[43] Advancements already obvious to such persons do not exhibit the level of ingenuity necessary to support a patent. On the other hand, meeting the standard of nonobviousness does not always require a "flash of creative genius." Non-obvious insights produced through laborious investigation, or even by accident, are no less qualified to receive a patent.[44] This is the principle expressed in the first sentence of § 103(c), which states that

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[39] *Cuno*, 314 U.S. at 92 (quoting Atlanta Works v. Brady, 107 U.S. 192, 200 (1883) (Bradley, J., dissenting)).

[40] *See In re* Dow Chem. Co., 837 F.2d 469, 472 (Fed. Cir. 1988) ("Most technological advance is the fruit of methodical, persistent investigation.").

[41] *See* Graham v. John Deere Co., 383 U.S. 1, 14 (1966) ("Patentability is to depend . . . upon the 'non-obvious' nature of the 'subject matter sought to be patented' to a person having ordinary skill in the pertinent art." (quoting 35 U.S.C. § 103 (2000))).

[42] 35 U.S.C. § 103 (2000). Although the Supreme Court viewed the standard of patentability as unchanged, *see Graham*, 383 U.S. at 4, the terminology nonetheless marked a departure from *Hotchkiss* and its progeny. Congress also sought to undo the effect of "the controversial phrase 'flash of creative genius.'" *Id.* at 15.

[43] Standard Oil Co. v. Am. Cyanamid Co., 774 F.2d 448, 454 (Fed. Cir. 1985).

[44] *See* Life Techs., Inc. v. Clontech Labs., Inc., 224 F.3d 1320, 1325 (Fed. Cir. 2000) ("[T]he path that leads an inventor to the invention is . . . irrelevant to patentability.").

"[p]atentability shall not be negatived by the manner in which the invention was made."[45]

The perspective of the person of ordinary skill has become as central to patent law as that of the reasonable person in tort law. Whether a patent satisfies the disclosure requirements of § 112, including enablement[46] and best mode,[47] is judged from the perspective of persons skilled in the art.[48] Patent claim language is interpreted from the same perspective,[49] and claims may be held indefinite[50] if they cannot be understood by persons of ordinary skill.[51] Finally, as we will see, the perspective of the person of ordinary skill plays a role in determining what infringes a patent through equivalence.[52]

In *Graham v. John Deere Co.*,[53] the Supreme Court explained the process to be followed in deciding whether an invention meets the standard of nonobviousness.[54] One must determine "the scope and content of the prior art," the "differences between the prior art and the claims at issue," and "the level of ordinary skill in the pertinent art."[55] With these facts in hand, one decides if the differences, and the level of ordinary skill, are such that the person of ordinary skill would have found the differences obvious or nonobvious at the time the invention was made.[56] The ultimate decision still seems conclusory; there is no breaking it down into simpler components. But

[45] 35 U.S.C. § 103(c) (2000).

[46] The patent specification must "enable any person skilled in the art to which it pertains . . . to make and use [the invention]." 35 U.S.C. § 112 (2000).

[47] The patent specification "shall set forth the best mode contemplated by the inventor of carrying out his invention." *Id.*

[48] *See* Amgen Inc. v. Hoechst Marion Roussel, Inc., 314 F.3d 1313, 1334 (Fed. Cir. 2003) (clarifying that a specification must enable persons skilled in the art to make and use the invention without undue experimentation); Bayer A.G. v. Schein Pharm., Inc., 301 F.3d 1306, 1320 (Fed. Cir. 2002) (explaining that the best mode is adequately disclosed if persons skilled in the art, reviewing the specification, can identify the best mode and practice it for themselves).

[49] Dayco Prods., Inc. v. Total Containment, Inc., 258 F.3d 1317, 1324 (Fed. Cir. 2001) ("[W]e must always be conscious that our objective is to interpret the claims from the perspective of one of ordinary skill in the art . . . .").

[50] *See* 35 U.S.C. § 112 (2000) ("The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.").

[51] *See* W.L. Gore & Assocs. v. Garlock, Inc., 721 F.2d 1540, 1557 (Fed. Cir. 1983) ("A patent is invalid only when those skilled in the art are required to engage in *undue* experimentation to practice the invention.").

[52] *See infra* text accompanying notes 224-228.

[53] 383 U.S. 1 (1966).

[54] *Id.* at 17 (stating the various factors to consider when analyzing whether an invention is "obvious").

[55] *Id.*

[56] *Id.*

the decision-maker may be aided, in appropriate cases, by certain "secondary considerations" of a more objective character. These include "commercial success, long felt but unsolved needs, failure of others, etc."[57] The Court admitted that there would be "difficulties" in applying the test of nonobviousness, and that lack of uniformity might occur. The difficulties, however, would be no worse than those encountered in other areas of the law – such as negligence – where the uncertain perspective of a hypothetical person decides important liability issues.[58]

The most significant development in the obviousness inquiry after *Graham* is the emphasis placed by the Federal Circuit Court of Appeals on those "secondary considerations" which, the Supreme Court said, "may have relevancy."[59] These considerations are not, in the view of the Federal Circuit, optional or "icing on the cake" – they must be considered in every case where they are present.[60] Secondary considerations are important because they promise a degree of objectivity and protection from the ever-present risk of "hindsight."[61] An expanded list of secondary considerations[62] would include:

- Long-felt but unresolved need;
- Failure of others;
- Commercial success;
- Industry recognition;
- Expressions of disbelief;
- Unexpected results;
- Copying; and
- Near-simultaneous invention.

Where the claimed invention solves a problem, long-felt need and the failure of others are strong evidence of nonobviousness. Had the solution been obvious to persons of ordinary skill, presumably they would have produced it

[57] *Id.* at 17-18.

[58] *Id.* at 18 ("The difficulties . . . are comparable to those encountered daily . . . in negligence . . . and should be amenable to a case-by-case development.").

[59] *Id.*

[60] Hybritech, Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1380 (Fed. Cir. 1986); *see also* Ruiz v. A.B. Chance Co., 234 F.3d 654, 667 (Fed. Cir. 2000).

[61] Crown Operations Int'l, Ltd. v. Solutia Inc., 289 F.3d 1367, 1376 (Fed. Cir. 2002); Arkie Lures, Inc. v. Gene Larew Tackle, Inc., 119 F.3d 953, 956 (Fed. Cir. 1997) ("Good ideas may well appear 'obvious' after they have been disclosed, despite having been previously unrecognized.").

[62] Those considerations specifically mentioned by the Supreme Court in *Graham* may carry greater weight than others, admitted through the open door of the "etc." *See* Ecolochem, Inc. v. S. Cal. Edison Co., 227 F.3d 1361, 1380 (Fed. Cir. 2000) ("The factors specifically mentioned in *Graham* [are] those that we give the most weight to in the instant case.").

already, addressing the need and avoiding the failure.[63] Commercial success suggests the same thing, in a more roundabout way. If the commercial success of a product within the scope of the patent is due to the unique way in which the claimed invention satisfies a need, the failure of others to reap the profits may indicate that the invention eluded their comprehension. In other words, if a profitable mousetrap had been obvious, someone else would have sold it already.[64] Industry recognition and expressions of disbelief provide direct evidence that persons skilled in the art were impressed with the invention. The recognition may come in the form of licensing,[65] or, in a backhanded way, through copying the patented invention.[66] Candid expressions of skepticism or disbelief, even more than statements praising the invention, may serve as compelling evidence of nonobviousness.[67] The one secondary consideration on the list that may indicate obviousness, rather than *non*obviousness,[68] is near-simultaneous invention. If others skilled in the art, working independently of the patentee, produced the same invention at about the same time (even if too late to serve as prior art under 35 U.S.C. § 102), this may indicate that the art

[63] *See In re* Dow Chem. Co., 837 F.2d 469, 472 (Fed. Cir. 1988) ("Recognition of need, and difficulties encountered by those skilled in the field, are classical indicia of nonobviousness.").

[64] *See* Dickey-John Corp. v. Int'l Tapetronics Corp., 710 F.2d 329, 346-47 (7th Cir. 1983). Although commercial success is a common secondary consideration, the logic of it requires careful handling of the evidence. It must be determined, for example, whether the success of the product is due to the claimed invention or to other factors, such as promotion, marketing, or unrelated design advantages. Brown & Williamson Tobacco Corp. v. Philip Morris Inc., 229 F.3d 1120, 1130 (Fed. Cir. 2000) (explaining that commercial success is relevant to nonobviousness where there is a "nexus" between that success and the claimed invention).

[65] *In re* GPAC Inc., 57 F.3d 1573, 1580 (Fed. Cir. 1995) ("Licenses taken under the patent in suit may constitute evidence of nonobviousness.").

[66] *See* Advanced Display Sys., Inc. v. Kent State Univ., 212 F.3d 1272, 1285-86 (Fed. Cir. 2000).

[67] *See Ecolochem*, 227 F.3d at 1380 (treating positive recognition as indicative of nonobviousness); Monarch Knitting Mach. Corp. v. Sulzer Morat GMBH, 139 F.3d 877, 885 (Fed. Cir. 1998) (remarking that general skepticism from those in the art is relevant as to nonobviousness); Gillette Co. v. S.C. Johnson & Son, 919 F.2d 720, 726 (Fed. Cir. 1990) (treating skepticism toward a patentee's "new-fangled approach" as objective evidence of nonobviousness). One form of expressing skepticism is "teaching away," or advocating an approach to a problem contrary to that adopted by the patentee. *Monarch Knitting*, 139 F.3d at 885.

[68] The absence of the preceding secondary considerations, according to the Federal Circuit, is not evidence of obviousness but a "neutral factor." *See* Medtronic, Inc. v. Intermedics, Inc., 799 F.2d 734, 739 n.13 (Fed. Cir. 1986) *cited with approval in* Gentry Gallery, Inc. v. Berkline Corp., 134 F.3d 1473, 1478 (Fed. Cir. 1998).

had advanced to the point where the invention had become inevitable, and indeed obvious even to persons of ordinary skill.[69]

C. *The Doctrine of Equivalents*

If the invention is nonobvious, and the other statutory requirements are met, the inventor is eligible to receive a patent. The value of the patent depends, in part, on its duration, generally a term of twenty years from the date the patent application was filed.[70] The value of a patent is equally a product of its *scope*.[71] If the rights conferred by a patent are so narrow that products beyond its scope are easily produced and easily substituted in the marketplace, the patent will be worth very little. If the rights are broad enough to encompass all reasonable substitutes, and the invention is one for which there is a demand, the patentee may reap substantial profits due to the absence of competition. A broader patent translates into a more substantial reward for the patentee, but at the expense of future inventors whose efforts are more likely to require the patentee's permission. Hence, the desired result of encouraging innovation, by one generation of inventors *and* the next, requires careful attention to the breadth of the exclusive rights granted by a patent.

Originally, the scope of a patent was determined primarily by example; the patentee described a working embodiment of the invention, and the patent encompassed other embodiments that were essentially the same. Patentees might assist the future fact finder by expressing, in "claims," a few salient points as to what it was that the patentee regarded as essential to the invention.[72] After the 1870 Patent Act, requiring patentees to "distinctly claim" the invention, the claim language gradually took on a new significance.[73] The former system of "central claiming" – dominated by the disclosure of the preferred embodiments – yielded to the current system of "peripheral claiming," where the claim language, like a deed, attempts to define the outer limits, the "metes and bounds," of the patentee's exclusive

[69] *See Ecolochem*, 227 F.3d at 1379; *In re* Merk & Co., 800 F.2d 1091, 1098 (Fed. Cir. 1986).

[70] 35 U.S.C. § 154(a)(2) (2000).

[71] *See* Cotropia, *supra* note 9, at 172 ("The breadth of the patent's scope . . . can prevent an early expiration."). As Cotropia points out, a patent claim of narrower scope is equivalent to a patent claim with a shorter term, because the substitution of non-patented products, resulting in the effective abolition of the patentee's monopoly, is likely to occur sooner. *Id.*

[72] *See* Cianfrani, *supra* note 7, at ¶ 13. Judge Newman outlines the history of claiming in her "commentary," appended to the Federal Circuit's en banc opinion in *Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 931, 957-59 (Fed. Cir. 1987) (en banc). The earliest form of claims often used phrases such as "substantially as described." *See* DONALD S. CHISUM, CHISUM ON PATENTS § 18.02[1] (2007).

[73] Patent Act of 1870 § 26, 16 Stat. 198, 201.

rights.[74] This accounts for the usually complex, technical, and legalistic claim language found at the conclusion of every patent. Patentees still must provide, in the patent specification, a detailed description of their preferred embodiments. This serves, in part, as satisfaction of the patentee's duty to enrich the knowledge of those skilled in the art with an enabling disclosure of the patentee's invention.[75] It also assists in understanding the meaning of the claim language.[76] But it is the claims, not the preferred embodiments, that determine what does or does not infringe the patent.[77] A patent claim resembles a checklist, describing all of the elements that, in combination, comprise the patented invention. If an accused product or process includes everything the claim describes, that claim is *literally* infringed.[78]

Because competitors of the patentee rely on the claims to tell them what they may or may not do, the modern Patent Act requires that claim language be definite.[79] However, no language, not even the most carefully constructed claim language, can ever be entirely free of ambiguity. Hence patentees are not required to describe their inventions with "mathematical precision";[80] the requirement of definiteness is satisfied if the claims "reasonably apprise those skilled in the art of [the] scope of the invention, and . . . the language is as precise as the subject matter permits."[81] "Words of degree," such as "substantially" and "approximate," are common in patent claims.[82] Yet there are occasions when claim language is sufficiently clear that competitors of the patentee can "design around" it, confident that what they are doing does not

[74] *See* S3 Inc. v. nVIDIA Corp., 259 F.3d 1364, 1369 (Fed. Cir. 2001).

[75] 35 U.S.C. § 112 (2000).

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

[77] Prima Tek II, L.L.C. v. Polypap, S.A.R.L., 318 F.3d 1143, 1148-49 (Fed. Cir. 2003).

[78] DeMarini Sports, Inc. v. Worth, Inc., 239 F.3d 1314, 1331 (Fed. Cir. 2001); *see also* Techsearch, L.L.C. v. Intel Corp., 286 F.3d 1360, 1371 (Fed. Cir. 2002); Suntiger, Inc. v. Scientific Research Funding Group, 189 F.3d 1327, 1336 (Fed. Cir. 1999) (indicating that unless the claim is specifically crafted to exclude them, the presence of additional elements in the accused product has no bearing on infringement).

[79] 35 U.S.C. § 112 (2000) (stating that claims must "particularly point out and distinctly claim the subject matter which the applicant regards as his invention"); All Dental Prodx, LLC v. Advantage Dental Prods., Inc., 309 F.3d 774, 779-80 (Fed. Cir. 2002) ("The primary purpose of the definiteness requirement is to ensure that the claims are written in such a way that they give notice to the public . . . so that interested [persons] can determine whether or not they infringe.").

[80] Oakley, Inc. v. Sunglass Hut Int'l, 316 F.3d 1331, 1341 (Fed. Cir. 2003) ("[A] patentee need not define his invention with mathematical precision in order to comply with the definiteness requirement."); *see also* Bancorp Servs. L.L.C. v. Hartford Life Ins. Co., 359 F.3d 1367, 1372 (Fed. Cir. 2004) (terms subject to different interpretations are not necessarily indefinite).

[81] Shatterproof Glass Corp. v. Libbey-Owens Ford Co., 758 F.2d 613, 624 (Fed. Cir. 1985).

[82] *See* Andrew Corp. v. Gabriel Elecs., Inc., 847 F.2d 819, 821 (Fed. Cir. 1988).

literally infringe.[83] That competitors cannot be equally confident in their freedom from liability is due to the long-established "doctrine of equivalents."

1. *Winans v. Denmead*

One of the earliest manifestations of the doctrine of equivalents is found in the 1854 Supreme Court case *Winans v. Denmead*.[84] The patent claimed a railroad car shaped, in part, like the "frustum of a cone," and suitable for transporting coal and similar materials.[85] The shape distributed the weight of the cargo in such a way that a car of relatively light construction could carry a heavy load without damage.[86] The accused infringer's railroad car was not circular in cross-section, as a cone would be, but octagonal.[87] Nevertheless, the shape was close enough to conical that similar benefits were obtained.[88] Reflecting the spirit of central claiming, the Court dismissed the importance of the "change of form":

> The exclusive right to the thing patented is not secured, if the public are at liberty to make substantial copies of it, varying its form or proportions. And, therefore, the patentee, having described his invention, and shown its principles, and claimed it in that form which most perfectly embodies it, is, in contemplation of law, deemed to claim every form in which his invention may be copied, unless he manifests an intention to disclaim some of those forms.[89]

The defendant would infringe if, in the opinion of the jury, the octagonal design was close enough to circular as "to embody the patentee's mode of operation, and thereby attain the same kind of result as was reached by his invention."[90] The result might not be "precisely the same in degree," but if "the same in kind, and effected by the employment of [the same] mode of operation in substance," the defendant could be found liable.[91] Justice Campbell, dissenting, decried the uncertainty introduced by ignoring the express language of the patent.[92]

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[83] *See* State Indus., Inc. v. A.O. Smith Corp., 751 F.2d 1226, 1236 (Fed. Cir. 1985) ("One of the benefits of a patent system is its so-called 'negative incentive' to 'design around' a competitor's products, even when they are patented, thus bringing a steady flow of innovations to the marketplace.").

[84] 56 U.S. (15 How.) 330, 332 (1854).

[85] *Id.* at 342.

[86] *Id.* at 340.

[87] *Id.*

[88] *Id.*

[89] *Id.* at 343.

[90] *Id.* at 344.

[91] *Id.*

[92] Specifically, Justice Campbell wrote:

> The claim of to-day is, that an octagonal car is an infringement of this patent. Will this be the limit to that claim? Who can tell the bounds within which the mechanical

2. *Graver Tank & Manufacturing Co. v. Linde Air Products Co.*

Nearly a century later, well into the era of peripheral claiming but shortly before passage of the 1952 Patent Act, the Supreme Court revisited the issue of equivalence in *Graver Tank & Manufacturing Co. v. Linde Air Products Co.*[93] The patent claimed a welding flux combining calcium fluoride with an "alkaline earth metal silicate."[94] The patentee's compound included magnesium, an alkaline earth metal.[95] The defendant's product used silicate of manganese instead.[96] Although magnesium and manganese sound similar, and they perform similarly in this context, manganese is not an alkaline earth metal, as the claim required.[97] The Court observed that "to permit imitation of a patented invention which does not copy every literal detail would be to convert the protection of the patent grant into a hollow and useless thing."[98] The "unscrupulous copyist," guided by the patent disclosure, could introduce "unimportant and insubstantial changes and substitutions . . . which, though adding nothing, would be enough to take the copied matter outside the claim, and hence outside the reach of law."[99] Thus, prohibiting only literal infringement would "place the inventor at the mercy of verbalism" and would "subordinat[e] substance to form."[100] To avoid that result, the Court would "'temper unsparing logic'"[101] by recognizing that equivalents of the claimed invention also infringe.

The equivalency principle applies where the accused product "'performs substantially the same function in substantially the same way to obtain the same result.'"[102] Elaborating, the Court offered the following guidance for determining when a product that does not literally infringe is still an equivalent of the claimed invention:

> What constitutes equivalency must be determined against the context of the patent, the prior art, and the particular circumstances of the case.

industry of the country may freely exert itself? What restraints does this patent impose in this branch of the mechanic art? . . . Nothing . . . will be more mischievous, more productive of oppressive and costly litigation, of exorbitant and unjust pretensions and vexatious demands, more injurious to labor, than a relaxation of [the] wise and salutary requisitions of the act of Congress [demanding that patentees describe their invention with particularity].

Id. at 347 (Campbell, J., dissenting).

93 339 U.S. 605 (1950).

94 *Id.* at 610.

95 *Id.*

96 *Id.*

97 *Id.*

98 *Id.* at 607.

99 *Id.*

100 *Id.*

101 *Id.* at 608 (quoting Sanitary Refrigerator Co. v. Winters, 280 U.S. 30, 42 (1929)).

102 *Id.*

> Equivalence, in the patent law, is not the prisoner of a formula and is not an absolute to be considered in a vacuum. It does not require complete identity for every purpose and in every respect. In determining equivalents, things equal to the same thing may not be equal to each other and, by the same token, things for most purposes different may sometimes be equivalents. Consideration must be given to the purpose for which an ingredient is used in a patent, the qualities it has when combined with the other ingredients, and the function which it is intended to perform. An important factor is whether persons reasonably skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was.
>
> A finding of equivalence is a determination of fact. Proof can be made in any form: through testimony of experts or others versed in the technology; by documents, including texts and treatises; and, of course, by the disclosures of the prior art.[103]

That the analysis is not the "prisoner of a formula" is perhaps an understatement, but the majority had no difficulty in finding that manganese in a welding flux is the equivalent of magnesium, whether or not it is an alkaline earth metal.[104] The testimony of chemists and the disclosures of the prior art established that manganese and magnesium react in similar ways, are found in the same ores, and serve the same purpose in a welding flux.[105] Earlier patents taught the use of manganese in welding.[106] One expert even testified that manganese might be considered an alkaline earth metal "'in the sense of the patent,'"[107] suggesting an alternative argument in favor of literal infringement. Specialists knew that manganese could be substituted for magnesium in the patentee's composition,[108] and there was no evidence that the defendant had developed its alternative through independent research, as opposed to copying.[109] Echoing Justice Campbell's sentiments in *Winans*, however, was Justice Black, whose dissent lamented the public's inability to rely on unambiguous claim language.[110]

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[103] *Id.* at 609.

[104] *Id.* at 612.

[105] *Id.* at 610-11.

[106] *Id.* at 611.

[107] *Id.*

[108] *Id.* at 612.

[109] *Id.*

[110] *See id.* at 614 (Black, J., dissenting) ("Giving this patentee the benefit of a grant that it did not precisely claim is no less 'unjust to the public' and no less an evasion of R.S. § 4888 merely because done in the name of the 'doctrine of equivalents.'").

3. Articulating a Standard

Although the Supreme Court abjured formulas, after *Graver Tank*, the dominant test for determining infringement under the doctrine of equivalents became the "triple identity" or "three-prong" test: Does the accused product or process perform substantially the same function, in substantially the same way, to achieve substantially the same result?[111] Indeed, the Federal Circuit became so enamored of the three-prong test that its application became almost formulaic. Not only were plaintiffs required to satisfy the three-prong test, they were required to offer separate proof, and linking arguments, to satisfy *each* prong.[112] The most objective consideration mentioned in *Graver Tank* – whether the alleged equivalent was known to substitute for the thing literally claimed – also remained important.[113] The Federal Circuit's most significant refinement of the equivalence analysis came in *Pennwalt Corp. v. Durand-Wayland, Inc.*,[114] where the court en banc held that *each element* of a patent claim must find at least an equivalent in the accused product or process; a general or overall similarity is insufficient.[115]

Because the Supreme Court in *Graver Tank* had stressed equitable considerations, characterizing infringement under the doctrine of equivalents as tantamount to piracy,[116] critics of the doctrine were tempted to limit its application to those situations where the defendant had indeed acted unfairly – perhaps exempting the good-faith competitor who designed around the claim language, or the defendant who, without knowledge of the patent, innocently developed a similar product.[117] In *Warner-Jenkinson Co. v. Hilton Davis Chemical Co.*,[118] the Supreme Court rejected that argument and for the first

[111] Malta v. Schulmerich Carillons, Inc., 952 F.2d 1320, 1325 (Fed. Cir. 1991).

[112] *Id.* at 1327; Lear Siegler, Inc. v. Sealy Mattress Co., 873 F.2d 1422, 1425 (Fed. Cir. 1989) ("In order to assure such separate analysis, we said in *Nestier*, . . . a jury must be separately directed to the proof of each *Graver Tank* element."). Without a structured analysis, it was said, juries would be "put to sea without guiding charts." *Lear Siegler*, 873 F.2d at 1426.

[113] Vulcan Eng'g Co. v. Fata Aluminum, Inc., 278 F.3d 1366, 1374 (Fed. Cir. 2002) ("Known interchangeability is an important factor in determining equivalence.").

[114] 833 F.2d 931 (Fed. Cir. 1987).

[115] *See id.* at 935; *see also* Bell Atl. Network Servs., Inc. v. Covad Commc'n Group, Inc., 262 F.3d 1258, 1279 (Fed. Cir. 2001) ("[T]here can be no infringement under the doctrine of equivalents if even one element of a claim or its equivalent is not present in the accused device.").

[116] *See* Graver Tank & Mfg. Co. v. Linde Air Prods. Co., 339 U.S. 605, 607-08 (referring to "the unscrupulous copyist," "pirat[ing] an invention," and "fraud on a patent").

[117] *See* Int'l Visual Corp. v. Crown Metal Mfg. Co., 991 F.2d 768, 774 (Fed. Cir. 1993) (Lourie, J., concurring) (postulating that "independent research result[ing] in an invention or product significantly different from what is claimed, albeit one that might perform substantially the same function in the same way to obtain the same result" may not justify the application of the doctrine of equivalents).

[118] 520 U.S. 17 (1997).

time in nearly fifty years reaffirmed the general contours of the doctrine of equivalents. The patent in *Warner-Jenkinson* claimed a method of filtering dye.[119] One of the claimed parameters was operation of the process at a pH level "from approximately 6.0 to 9.0."[120] The defendant's process operated at a pH level of 5.0, which the patentee admitted fell outside the scope of literal infringement.[121] The Court declined to limit the doctrine of equivalents to instances of piracy, which would, in any case, be difficult to distinguish from instances of designing around.[122] Regardless of the defendant's intent, the Court maintained, there is still a fundamental identity between a claimed invention and its equivalent that justifies a finding of infringement.[123] Independent research, or the lack of it, is relevant primarily for the light it sheds on the factor of "known interchangeability."[124]

A remaining question was how to articulate the measure of equivalence.[125] The Court observed that the "'triple identity'" test, perhaps suitable for mechanical combinations, "provides a poor framework for analyzing other products or processes."[126] On the other hand, the insubstantial differences test, offered as an alternative,[127] provides "little additional guidance as to what might render any given difference 'insubstantial.'"[128] In the end, the Court declined to adopt any particular formula or framework, leaving that task to the lower courts:

> In our view, the particular linguistic framework used is less important than whether the test is probative of the essential inquiry: Does the accused product or process contain elements identical or equivalent to each claimed element of the patented invention? Different linguistic frameworks may be more suitable to different cases, depending on their particular facts. A focus on individual elements and a special vigilance

[119] *Id.*

[120] *Id.* at 22.

[121] *Id.* at 23.

[122] *Id.* at 34-35 (stating that while "*Graver Tank* refers to the prevention of copying and piracy when describing the benefits of the doctrine of equivalents," that "does not mean that its application is limited only to cases where those particular benefits are obtained") .

[123] *Id.* at 35 (reasoning that "[i]f the essential predicate of the doctrine of equivalents is the notion of identity," then there is no difference between "an infringing equivalent" and "a device that infringes" literally, and there is no proof of intent requirement).

[124] *Id.* at 36 ("The need for independent experimentation thus could reflect knowledge – or lack thereof – of interchangeability possessed by one presumably skilled in the art.").

[125] *Id.* at 39 ("All that remains is to address the debate regarding the linguistic framework under which 'equivalence' is determined.").

[126] *Id.* at 39-40.

[127] *See* Valmont Indus., Inc. v. Reinke Mfg. Co., 983 F.2d 1039, 1043 (Fed. Cir. 1993) (stating that an equivalent is "an insubstantial change which, from the perspective of one of ordinary skill in the art, adds nothing of significance to the claimed invention").

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

> against allowing the concept of equivalence to eliminate completely any such elements should reduce considerably the imprecision of whatever language is used. An analysis of the role played by each element in the context of the specific patent claim will thus inform the inquiry as to whether a substitute element matches the function, way, and result of the claimed element, or whether the substitute element plays a role substantially different from the claimed element. With these limiting principles as a backdrop, we see no purpose in going further and micromanaging the Federal Circuit's particular word choice for analyzing equivalence. We expect that the Federal Circuit will refine the formulation of the test for equivalence in the orderly course of case-by-case determinations, and we leave such refinement to that court's sound judgment in this area of its special expertise.[129]

Since that time, the Federal Circuit has made little progress in developing a refined formulation of equivalence. If anything, its approach has become more generalized than before. Although the Supreme Court had little to say in favor of the insubstantial differences test, that test appears to have replaced the triple identity test as the dominant linguistic framework.[130]

4. Setting Limits

In *Warner-Jenkinson*, the Court admitted that the doctrine of equivalents could go too far, "tak[ing] on a life of its own, unbounded by the patent claims."[131] "[A]pplied broadly, [the doctrine] conflicts with the definitional and public-notice functions of the statutory claiming requirement."[132] In order to prevent this conflict, courts limit the scope of equivalence in various ways. One way, endorsed by the Supreme Court in *Warner-Jenkinson*, is to demand that each and every element of the patent claim be matched by an identical or equivalent element in the accused product.[133] In addition, the patentee may surrender potential equivalents if they are disclosed in the patent but omitted from the subject matter explicitly claimed. Competitors of the patentee, seeing such alternatives disclosed but not claimed, may consider them "dedicated to the public."[134] Another limitation is found in the prior art. Equivalence cannot

[129] *Id.*

[130] Toro Co. v. White Consol. Indus., 266 F.3d 1367, 1370 (Fed. Cir. 2001) ("To determine whether the accused device includes equivalents for a claim limitation, this court applies the 'insubstantial differences' test."); *cf. id.* ("In appropriate cases the function-way-result test offers additional guidance on the question of equivalence.").

[131] 520 U.S. at 28-29.

[132] *Id.* at 29.

[133] *Id.* ("It is important to ensure that the application of the doctrine, even as to an individual element, is not allowed such broad play as to effectively eliminate that element in its entirety.").

[134] *See* Johnson & Johnston Assoc., Inc. v. R.E. Serv. Co., 285 F.3d 1046, 1054 n.1 (Fed. Cir. 2002) (en banc).

expand the scope of the claim so much that it encompasses the prior art as well as the accused product.[135] One way to approach this issue is to ask if the Patent Office could have issued a claim broad enough to have been literally infringed, or whether such a claim would have been rejected as obvious or anticipated.[136]

One of the most important limitations on equivalents is the doctrine of "prosecution history estoppel." If the patentee surrendered certain subject matter in order to successfully prosecute the patent application, the patentee is estopped from recapturing that same subject matter by asserting equivalence in a subsequent lawsuit.[137] Anything less would contradict the public record,[138] and it would allow applicants to evade Patent Office scrutiny of their more ambitious claims.[139]

In 2000, the Federal Circuit surprised the Patent Bar by adopting, in an en banc decision, a less flexible interpretation of prosecution history estoppel than most of the precedent had suggested.[140] In *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*,[141] the majority ruled that if a claim element is narrowed during prosecution for any reason related to patentability, the patentee is barred subsequently from asserting *any* range of equivalents for that element, even if not closely related to what the patentee had relinquished.[142] On appeal,[143]

[135] Interactive Pictures Corp. v. Infinite Pictures, Inc., 274 F.3d 1371, 1380 (Fed. Cir. 2001) ("It is well settled law that a patentee cannot assert a range of equivalents that encompasses the prior art.").

[136] *See* Wilson Sporting Goods Co. v. David Geoffrey & Assoc., 904 F.2d 677, 684 (Fed. Cir. 1990) ("[A] patentee should not be able to obtain, under the doctrine of equivalents, coverage which he could not lawfully have obtained from the PTO by literal claims.").

[137] Gen. Elec. Co. v. Nintendo Co., 179 F.3d 1350, 1363 (Fed. Cir. 1999) ("'The essence of prosecution history estoppel is that a patentee should not be able to obtain, through the doctrine of equivalents, coverage of subject matter that was relinquished during prosecution to procure issuance of that patent.'" (quoting Hoganas AB v. Dresser Indus., Inc., 9 F.3d 948, 951-52 (Fed. Cir. 1993))).

[138] *See* Lemelson v. Gen. Mills, Inc., 968 F.2d 1202, 1208 (Fed. Cir. 1992) ("Other players in the marketplace are entitled to rely on the record made in the Patent Office in determining the meaning and scope of the patent.").

[139] *See* Genentech, Inc. v. Wellcome Found. Ltd., 29 F.3d 1555, 1564 (Fed. Cir. 1994) ("[A]void[ing] 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 PTO did not examine.").

[140] *See, e.g.*, Insta-Foam Prods., Inc. v. Universal Foam Sys., Inc., 906 F.2d 698, 703 (Fed. Cir. 1990) ("'Depending on the nature and purpose of an amendment it may have a limiting effect within a spectrum ranging from great to small to zero.'" (quoting Hughes Aircraft Co. v. United States, 717 F.2d 1351, 1363 (Fed. Cir. 1983))).

[141] 234 F.3d 558 (Fed. Cir. 2000) (en banc), *vacated*, 535 U.S. 722 (2002).

[142] *Id.* at 574 ("[P]rosecution history estoppel acts as a complete bar to the application of the doctrine of equivalents when an amendment has narrowed the scope of a claim for a reason related to patentability.").

however, the Supreme Court reinstated a more flexible approach to estoppel and, more importantly for our purposes, offered its most recent thoughts on the nature and objective of the doctrine of equivalents.[144]

The Court observed that, like the boundaries of any property, the boundaries of the patent monopoly should be clear; "[a] patent holder should know what he owns, and the public should know what he does not."[145] Clarity is "essential" to the progress of technology because it "enables efficient investment in innovation."[146] "If competitors cannot be certain about a patent's extent, they may be deterred from engaging in legitimate manufactures outside its limits, or they may invest by mistake in competing products that the patent secures."[147] The problem lies in the nature of language – an inadequacy that makes it impossible to "capture the essence of a thing in a patent application."[148] Because language may fail to mirror every nuance of the invention or "describe with complete precision the range of its novelty," the courts have preserved the value of patents, even at the cost of uncertainty, by proscribing "[u]nimportant and insubstantial substitutes for certain elements."[149] Whether prosecution history estoppel comes into play depends, ultimately, on whether the shortcomings of descriptive language still explain the need to resort to equivalence, or whether the applicant had the words necessary to describe the invention more broadly but chose not to use them in order to ensure that the patent would issue.[150]

5. "Substantial" Problems

Arguments against the doctrine of equivalents are as old as the doctrine itself. In brief, infringement by equivalence subverts the notice function of the claims, required by statute to describe the invention "distinctly," and it short-

[143] Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722 (2002).

[144] *Id.* at 738 ("While this Court has not weighed the merits of the complete bar against the flexible bar in its prior cases, we have consistently applied the doctrine in a flexible way, not a rigid one.").

[145] *Id.* at 731; *see also* Cianfrani, *supra* note 7, at 29.

[146] *Festo*, 535 U.S. at 730-31.

[147] *Id.* at 732; *see also* Cianfrani, *supra* note 7, at 21 (referring to the "chilling effect" on modifications that are beyond the reach of the patent, but not so far out of reach as to make a potential improver certain of prevailing in a dispute). "In addition the uncertainty may lead to wasteful litigation between competitors, suits that a rule of literalism might avoid." *Festo*, 535 U.S. at 732.

[148] *Festo*, 535 U.S. at 731; *see also id.* at 734 ("The doctrine of equivalents is premised on language's inability to capture the essence of innovation . . . .").

[149] *Id.* at 731.

[150] "The patentee must show that at the time of the amendment one skilled in the art could not reasonably be expected to have drafted a claim that would have literally encompassed the alleged equivalent." *Id.* at 741. This might be accomplished by demonstrating that the equivalent was unforeseeable, or that the rationale for the narrowing amendment bore only "a tangential relation to the equivalent in question." *Id.*

circuits the process by which the patentee's monopoly must be approved, in advance, through expert examination at the Patent Office. The Supreme Court has consistently held these trade-offs acceptable, and necessary, to preserve the value of patents, without which innovation would be insufficiently rewarded. Congress has shown no inclination to intervene. Yet it is difficult to regard the matter of equivalence as settled when the test to be applied in every case is so inadequately described.

Many standards applied in law are succinct in form and subjective in application. Negligence, for example, can be described to a jury as a failure to act as a reasonable person would under the circumstances. Equivalence can be, and has been, compared to these other hard questions. In *Warner-Jenkinson*, for example, the Court remarked that "[m]uch as the perspective of the hypothetical 'reasonable person' gives content to concepts such as 'negligent' behavior, the perspective of a skilled practitioner provides content to, and limits on, the concept of 'equivalence.'"[151] But is that actually the case?

Jurors contemplating negligence have a mental yardstick to apply, however imperfect it may be. Jurors can imagine themselves in the circumstances of the defendant, can imagine (if necessary) that they have the foresight and wisdom of a "reasonable person," and can further imagine their likely reaction to the circumstances of an accident. Would they have slammed on the brakes, or tried to cross the drawbridge before it opened? Jurors asked to judge equivalence,[152] however, face a different kind of challenge. They are provided with a multitude of facts, including all the ways in which a claim element and an alleged equivalent are similar, and different. They will always be similar in some ways, or there would be no equivalence argument at all, and different in others, or there would be literal infringement. Jurors may be told everything that persons skilled in the art knew about the subject, including whether A was known to substitute for B. All of this, however, is data; it does not decide the question. What matters is whether the differences are substantial. What it takes to be "substantial" is not just obscure, it is *undefined*. It is not only that jurors must imagine themselves in a more challenging role – the role of a person skilled in a technical subject matter. Even if the jurors can assume the personality and adopt the wisdom of the person of ordinary skill, assuming such wisdom still brings them no closer to understanding what "substantial" means. In contrast to the reasonable person standard, there is no mental reaction, real or imaginary, that jurors can use to measure substantiality.[153]

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[151] Warner-Jenkinson Co. v. Hilton Davis Chem. Co., 520 U.S. 17, 37 (1997).

[152] Although claim interpretation is a question of law for the court, equivalence is a question of fact for a jury. *Id.* at 38-39.

[153] One can imagine a dialogue between an uncertain juror and a judge versed in patent law: "Q: How large a difference is a 'substantial' difference? A: Large enough for you to give it legal effect. Q: When should I give the difference legal effect? A: When it is substantial."

The triple identity test offers only the *illusion* of greater substance. It requires the fact finder to consider three issues – function, way, and result.[154] Inevitably, the alleged equivalent performs generally (if not precisely) the same function as the claim element, and achieves generally (if not precisely) the same result. What is most likely to differ is the "way" the result is achieved.[155] One can heat a cup of water on an electric stove or in a microwave oven. The stove and the oven perform the same function and achieve the same result (or a similar result, if speed is a consideration). They operate, though, in different ways – the stove heating by resistance and conduction; the microwave oven by radio waves, which cause the water molecules to jostle in a fluctuating magnetic field. If heating the water were part of a patented process, a juror might be asked to determine whether the stove and the oven performed substantially the same function, in substantially the same way, to achieve substantially the same result. Again, substantiality is the threshold. Let us suppose that the juror finds functions and results indistinguishable, but is unsure about the "way" – undoubtedly different, but perhaps substantially the same. Both stove and oven heat the water by electricity, so in some ways they are more alike than a gas stove would be to either. Electric stoves and microwave ovens are easily substituted – something even casual chefs know. But physicists would testify that microwave ovens and electric stoves operate in fundamentally different "ways." How could a conscientious juror, guided only by the term "substantially," reach a principled decision?

The substantial differences test has achieved no greater refinement because it is, essentially, a dead end. One might as well invite fact finders to hold an equivalent equivalent if it is equivalent. The Supreme Court did almost that by rejecting any particular "linguistic framework" in favor of the "essential inquiry: Does the accused product or process contain elements identical or equivalent to each claimed element of the patented invention?"[156] But with so little guidance, fact finders may, in effect, invent their own rules.

If one were searching for a measure of similarity that does mean something, one would find it close at hand in the concept of obviousness. Obviousness depends upon the mental state of a hypothetical person under hypothetical circumstances – not an easy thing to determine, but comparable to the "reasonable person" standard. In contrast to decisions based on substantiality, an obviousness determination has, at least *theoretically*, a right answer and a wrong answer, mirroring discoverable realities in the world outside of the courtroom. Objective factors like known interchangeability are *connected* to

[154] "Function" and "result" are difficult to distinguish, so long as the function of an element in a combination is to achieve a particular result.

[155] *See* Slimfold Mfg. Co. v. Kinkead Indus., Inc., 932 F.2d 1453, 1457 (Fed. Cir. 1991) ("In the present case, as often happens in doctrine of equivalents cases, there is no material dispute about the 'function' and the 'result' prongs of the test.").

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

obviousness in a way they are not connected to abstract substantiality, and additional objective considerations – like commercial success – could assist the decision maker. Accordingly, even the "ordinary skilled mechanic" of patent doctrine, frustrated with the current test of equivalence, might propose a symmetrical approach: if the claimed invention is obvious compared to the prior art, it is invalid; if the accused product is obvious compared to the claimed invention, it infringes. Unfortunately, this simple approach has serious problems of its own.

II. WHY SYMMETRY IS NOT SIMPLE

A rule of thumb known to every student of patent law is that whatever literally infringes a patent if it comes later in time, anticipates if it came before.[157] In other words, if a product introduced after the patentee's invention would literally infringe – by including each and every element of the claim, exactly as described – the same product, if it were discovered in the prior art, would anticipate the claim and render it invalid for lack of novelty. One is tempted to extend the symmetry by saying that a product close enough to have rendered the claimed invention obvious if it came before is close enough to infringe by equivalence if it came later. However, the pairing of obviousness and equivalence does not work out as neatly as the pairing of anticipation and literal infringement, for at least two reasons. One is the problem of tying the conclusion of obviousness to the patentee's invention. The other is the problem of accounting for the time-dependent nature of obviousness.

A. *Tying Obviousness to the Patentee's Invention*

A simplified patent claim might read:

> A mousetrap comprising:
>
> - a spring;
> - a trigger;
> - a latch to release said spring when a mouse disturbs said trigger; and
> - means, activated by the release of said spring, to capture the mouse.

A patent claim is a not a description of one thing, but a description of a class of things, all of which embody the "invention." To focus on one element only, the spring might be described in the patent specification as a two-inch length of tightly-wound steel, but the claim would be literally infringed by any mousetrap that included a spring of any kind, together with the other claim elements. Hence, the claim encompasses traps with large springs, small springs, plastic springs, and so forth. At the same time, any single prior art

[157] Dow Chem. Co. v. Astro-Valcour, Inc., 267 F.3d 1334, 1339 (Fed. Cir. 2001) ("[T]hat which would literally infringe if later in time anticipates if earlier than the date of invention." (quoting Lewmar Marine, Inc. v. Barient, Inc. 827 F.2d 744, 747 (Fed. Cir. 1987), *cert. denied*, 484 U.S. 1007 (1988))).

mousetrap within the class described by the claim, whether it had the same kind of spring or a different kind, would be sufficient to anticipate the claim.[158] In this respect, literal infringement and anticipation are symmetrical.

Obviousness is more subtle; it may be based on one prior art reference, or the combination of several.[159] The question is whether, at the time the invention was made, the differences between the prior art and the claimed invention would have been obvious to a person of ordinary skill. If the prior art included a mousetrap with all of the claim elements but a rubber band in place of a spring, one would ask whether the substitution of a spring would have been obvious. Although it is seldom put in these terms, it would be logical and consistent to say that if *any* mousetrap within the class of mousetraps encompassed by the claim would have been obvious, the claim should be rejected. If there were several mousetraps in the prior art that alone or in combination would have rendered the claimed invention obvious, there would be no need to choose among them. A once-popular image was that of a person of ordinary skill standing in his workshop surrounded by a "tableau" of all of the relevant prior art.[160] If any of the collective wisdom represented in that tableau rendered the invention obvious, the patent claim would be rejected.

Now suppose it was the accused mousetrap that, having all of the other claim elements, substituted a rubber band for the spring. Further suppose that "spring" cannot be interpreted to include rubber bands, so the claim is not literally infringed. In a symmetrical system, one would ask whether the accused mousetrap infringed as an equivalent because it was obvious. But obvious compared to what?

In discussing infringement, the place to start is the claim, even when the issue is one of infringement by equivalence. An obviousness analysis, on the other hand, logically begins with a disclosure of information – a foundation for further advancements. A person skilled in the art might read a technical bulletin, or examine a product, and could, based on what is disclosed there, in combination with other knowledge, conclude that further improvements or variations were obvious. A claim also has some value as a disclosure – claims are, strictly speaking, a part of the patent specification,[161] whose function is to

[158] *See* Atlas Powder Co. v. Ireco, Inc., 190 F.3d 1342, 1346 (Fed. Cir. 1999) ("[I]f granting patent protection on the disputed claim would allow the patentee to exclude the public from practicing the prior art, then that claim is anticipated, regardless of whether it also covers subject matter not in the prior art.").

[159] If obviousness is based on a combination of references, there must have been in the prior art a suggestion or motivation to effect the combination. Boehringer Ingelheim Vetmedica, Inc. v. Schering-Plough Corp., 320 F.3d 1339, 1354 (Fed. Cir. 2003).

[160] *See* Para-Ordnance Mfg. v. SGS Imps. Int'l, Inc., 73 F.3d 1085, 1088 (Fed. Cir. 1995) ("Put another way, would one of ordinary skill in the art who set out to solve the problem of increasing ammunition capacity, and who had before him in his workshop the prior art, have been reasonably expected to use the solution that is claimed in the . . . patent.").

[161] *See* Phillips v. AWH Corp., 415 F.3d 1303, 1315 (Fed. Cir. 2005) (en banc) ("[C]laims 'must be read in view of the specification, of which they are a part.'" (quoting

educate – but a claim serves primarily as a legal definition of the scope of the patent. A person skilled in the art looking for a technical understanding of the invention – a disclosure of information – would normally turn to the description of the preferred embodiments. It would be more meaningful, therefore, to examine the substitution of a rubber band for the spring in the context of the preferred embodiments, where the detailed disclosure might reveal that a rubber band is, or is not, an obvious substitution.

One could, therefore, simply compare the patentee's preferred embodiment to the accused device to see if the differences were obvious. This would revive, in a rather stark way, the model of "central claiming." Here, we would face serious difficulties, not the least of which is more than a century of jurisprudence emphasizing the primacy of the claim language. The Patent Office defines the invention by the claim language. Preferred embodiments include many details recited to satisfy the patentee's disclosure requirements, but unnecessary to distinguish the patentee's invention. If the infringement inquiry focused only on the preferred embodiments, these irrelevant details might have a decisive effect.

Similarly, if one were only comparing the accused product to the preferred embodiments, one might find aspects of the accused product that made it, in a general sense, nonobvious, but which did not prevent it from falling within the scope of the patentee's invention. To return to the example, suppose that the patentee's preferred embodiment includes a steel spring and a bell (unclaimed) to signal that a mouse has been captured. The accused product includes a rubber band, and an electric buzzer to signal success. If a person skilled in the art were comparing the two mousetrap designs, the obviousness inquiry might turn to the difference between a bell and a buzzer, which has nothing to do with the combination claimed as an invention. In some way, any infringement determination, even one using a standard of obviousness, has to be grounded in the claims.

Another concern, if obviousness were in fact the standard for infringement, would be one of (to coin a term) "connectedness." If a claim is obvious in comparison to the prior art, it is immaterial whether it is one piece of prior art or another that made it so. In an infringement inquiry, it would be necessary to *link* the obviousness of the accused product to the patentee's invention. A person skilled in the art might consider the accused mousetrap and find it obvious even if the patentee had never entered the picture. Imagine, for example, that what had set the patentee's mousetrap apart from the prior art was the inclusion of a spring. Other mousetrap designs, and rubber bands used in those designs or elsewhere, might be enough, without any reference to the patent, to make the accused mousetrap an obvious design. But it would be no more logical to conclude that the mousetrap infringed the patent just because the mousetrap was obvious than it would be to conclude that a bicycle, for

Markman v. Westview Instruments, Inc., 52 F.3d 967, 978 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370 (1996))).

example, infringed the patent because the bicycle was obvious. The problem may not be as bad as it seems, because if the prior art made the accused product obvious, other principles prevent the scope of equivalence from reaching so far.[162] But in some cases, the art that made the accused product obvious might have come after the patent. Consequently, the inquiry must somehow connect the patentee's invention to the condition of obviousness.

These problems are not insurmountable, and the solution seems to lie in the general approach already used to determine equivalence. Today the claim is the basis of comparison, and each element of the claim must find a counterpart in the accused product.[163] Whether the counterpart is equivalent is judged in light of the teachings of the entire patent. A similar approach could be used if obviousness were the measure of equivalence. Reverting to the mousetrap example, one could ask whether it would be obvious to substitute a rubber band for the spring specified in the claim, in light of the teachings of the patent and the general knowledge of one skilled in the art. The information disclosed in the specification would play a significant role, but the claim would limit the inquiry and tie it specifically to the invention, as the invention was represented to the Patent Office. "Connectedness" would also be much less of an issue. There could be obvious/infringing mousetraps that were developed without any knowledge, or even possible knowledge, of the patentee's work, but infringement has never depended on knowledge of the patent,[164] nor, for that matter, has obviousness ever depended on the inventor's actual knowledge of the prior art.[165] The connectedness issue is about making sure that the accused product is so related to the claim that it falls within the broader penumbra that

[162] *See supra* note 135 and accompanying text (explaining that equivalence cannot expand the scope of the claim so much that it encompasses the prior art as well as the accused product).

[163] *See supra* note 115 and accompanying text (stating that each element of a patent claim must find at least an equivalent in the accused product or process).

[164] *See* Jurgens v. CBK, Ltd., 80 F.3d 1566, 1570 n.2 (Fed. Cir. 1996) (noting that infringement "is a strict liability offense").

[165] Most prior art references are theoretically available to anyone of skill in the art exercising ordinary diligence. *See* Carella v. Starlight Archery & Pro Line Co., 804 F.2d 135, 139 (Fed. Cir. 1986) ("The statutory language, 'known or used by others in this country,' means knowledge or use which is accessible to the public."). On occasion, however, the reference is extremely obscure. *See* Bruckelmyer v. Ground Heaters, Inc., 445 F.3d 1374, 1379-80 (Fed. Cir. 2006) (describing figures deleted from a Canadian patent, but present in the patent's prosecution file, as "publicly accessible"). Also, a patent may be held invalid if obvious in comparison to a patent application that was not accessible to the public at the time the invention was made. *See* 35 U.S.C. § 102(e) ("A person shall be entitled to a patent unless . . . the invention was described in . . . an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent . . . ."); Oddzon Prods., Inc. v. Just Toys, Inc., 122 F.3d 1396, 1402 (Fed. Cir. 1997) (stating that "secret prior art" under section 102(e) will become public eventually).

might be characterized as the invention. The element-by-element approach, and the idea of substitution, seems sufficient to eliminate the case of infringing bicycles and, indeed, infringing mousetraps that are not very close to what the patentee claimed.[166]

B. *Temporal Anomalies*

Obviousness, as a matter of patent validity, is judged from the perspective of "the time the invention was made,"[167] meaning the time when the invention was conceived and reduced to practice by the patentee, either by constructing a working prototype[168] or by filing a patent application with an enabling disclosure.[169] As any technological art progresses, the knowledge possessed by those of ordinary skill increases and more things become obvious. The patentee is not penalized by this; validity is a matter of what the patentee contributed to the advancement of the art at the time the contribution was made. It is particularly necessary to avoid hindsight in judging the significance of that contribution.

If an obviousness standard were used to determine equivalence, the temporal perspective would be critical. The most symmetrical option would be to adopt, as in the case of validity, the perspective of the time when the invention was made. A second option would be to consider the time when the patent application was filed, which would more closely follow the literal infringement inquiry.[170] This perspective ensures that the courts and the Patent Office construe the claims in the same manner. A final option, and the one that seems most consistent with current practice, would be to judge the obviousness/equivalence of the accused product at the time of the alleged infringement.[171] All of these choices present difficulties.

Suppose that an inventor patents the design of an amplifier circuit, one element of which is described in the claims as "a vacuum tube." After the patent issues, other scientists develop the transistor – a revolutionary advancement, but an easy substitute for vacuum tubes in many applications, including the patented circuit. Subsequently, a third party duplicates the patented circuit, but avoids literal infringement by substituting a transistor for

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[166] If the spring, as hypothesized before, was the one thing that distinguished the patented invention, it is less likely that the substitution of a rubber band would be considered obvious, particularly if the patent touted the spring as superior to a rubber band.

[167] 35 U.S.C. § 103 (2000).

[168] *See* Slip Track Sys., Inc. v. Metal-Lite, Inc., 304 F.3d 1256, 1265 (Fed. Cir. 2002) (holding that a method claim is reduced to practice by performing the steps of the method).

[169] Cooper v. Goldfarb, 154 F.3d 1321, 1327 (Fed. Cir. 1998).

[170] Literal infringement depends upon the meaning of the claim language to a person of ordinary skill in the art at the time of the application. *See* Kopykake Enterprises, Inc. v. Lucks Co., 264 F.3d 1377, 1383 (Fed. Cir. 2001) ("[The court] consider[s] the meaning of the claim as of the date of the invention.").

[171] *See* Warner-Jenkinson Co. v. Hilton Davis Chem. Co., 520 U.S. 17, 37 (1997).

the vacuum tube. This would seem an ideal situation in which to apply the doctrine of equivalents.[172] It is not the patentee's fault that the claims did not specifically refer to transistors. Patentees cannot predict the future. The accused infringer, adding no new insights to the information disclosed in the patent, duplicated the essence of the invention. He might even be considered an "unscrupulous copyist." Finally, the patent could be rendered "a hollow and useless thing," no matter how valuable the circuit, if it were strictly limited to vacuum tubes. Because of a tangential advancement in the electronics art, perhaps *anyone* building the patented circuit would naturally substitute a transistor.

Transistors and vacuum tubes work in different ways, perhaps *substantially* different ways, but based on the reasoning and rhetoric offered in support of the doctrine of equivalents, the right answer in this scenario seems to be that the vacuum tube and the transistor are equivalent. In similar cases, digital computers have been held equivalent to analog computers,[173] and on-board satellite control systems equivalent to ground-based systems.[174] But if obviousness was the measure of equivalence, and the relevant perspective was that of the time when the invention was made (or the time when the patent application was filed), the transistor could not be considered an equivalent. The transistor was a revolutionary development – the basis of a 1956 Nobel Prize[175] – so it could hardly be considered an obvious substitution before it had been invented. Equivalence would be limited to substitutions already obvious when the claims were drafted. As to those equivalents, however, one could more readily blame the patentee for failing to claim them explicitly.

Because the earlier temporal perspective seems to rob the doctrine of equivalents of its best justification, the logical time to judge the obviousness of a substitution would be the time of the infringement. But here other difficulties arise. Let us now imagine that the patent calls for, and specifically

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[172] *See* Smithkline Beecham Corp. v. Excel Pharm., Inc., 356 F.3d 1357, 1364 (Fed. Cir. 2004) (referring to "after-arising technology" as "the quintessential example of an enforceable equivalent").

[173] *See* Decca Ltd. v. United States, 544 F.2d 1070, 1079-81 (Ct. Cl. 1976) (per curiam). In *Decca*, the accused device literally infringed the claim, so the discussion apparently came in the context of the reverse doctrine of equivalents. *Id.* at 1079. That rarely-applied doctrine holds that a device does not infringe, even though it falls within the literal language of the claim, if it is "so far changed in principle from a patented article that it performs the same or a similar function in a substantially different way." Graver Tank & Mfg. Co. v. Linde Air Prods. Co., 339 U.S. 605, 608 (1950).

[174] *See* Hughes Aircraft Co. v. United States, 717 F.2d 1351, 1364-65 (Fed. Cir. 1983). *But cf.* Texas Instruments, Inc. v. U.S. Int'l Trade Comm'n, 805 F.2d 1558, 1570 (Fed. Cir. 1986) (finding that the totality of technological advancements made newer pocket calculators noninfringing, even though each change in isolation might be considered the substitution of an equivalent).

[175] Physics 1956, http://nobelprize.org/nobel_prizes/physics/laureates/1956/ (last visited Oct. 20, 2007).

claims, a resistor as a feature of the amplifier circuit. A new defendant, whom we will call Competitor A, designs around the patent by devising a way to substitute a diode for the resistor. This is no easy substitution. The revised circuit requires considerable development effort, and it is contrary to the accepted teachings of the electronics art; but the result, unexpectedly, is a more efficient circuit with superior linearity. Competitor A has advanced the art of circuit design in a manner potentially worthy of its own patent. Here, the changes made by Competitor A were nonobvious, and therefore nonequivalent. So far so good. However, now suppose that Competitor B enters the picture and copies Competitor A's circuit. Once Competitor A's circuit has been used in a commercial product, it becomes a part of the knowledge available to persons of ordinary skill in the art. If Competitor B is the defendant, now the revised circuit may be considered an equivalent because at the time of Competitor B's infringement, thanks to Competitor A's pioneering efforts, the changes were obvious. Competitor A, therefore, can make the revised circuit without the permission of the patentee; Competitor B cannot make an identical circuit.

In a way this result seems just; Competitor A made a real contribution to the art, while Competitor B is the sort of copyist originally targeted by the doctrine of equivalents. However, this would put Competitor A, as a competitor of Competitor B, in a unique situation. Competitor A's advancement might be worthy of a patent monopoly, because it satisfies the requirement of nonobviousness. That does not mean, however, that Competitor A actually has a patent. A patent might be unavailable because, for example, Competitor A sold a product more than one year before filing an application,[176] or because Competitor A was unwilling to provide a full patent disclosure, preferring to maintain some proprietary information as a trade secret. Yet Competitor A would still have some of the monopoly advantages of a patent, because only Competitor A could make the revised circuit, at least without paying royalties to the original patentee. This advantage to Competitor A might be only what it needs to recoup its development costs; on the other hand, it seems quite problematic to give Competitor A even this much competitive advantage without the formalities and quid pro quo of an actual patent.

Another alternative would be to judge obviousness/equivalence at the time the substitution was made, even if it was first made by someone other than the defendant. In other words, if Competitor A's revisions to the patented circuit were nonobvious at the time, neither Competitor A nor anyone else subsequently making the same circuit would be held to infringe under the doctrine of equivalents. This would cure the problem of Competitor A's quasi-monopoly, but it would introduce an aspect of fortuity, as well as difficulties of proof. If a defendant were accused of infringement by equivalence, the case

[176] *See* 35 U.S.C. § 102(b) (2000) ("A person shall be entitled to a patent unless . . . the invention was . . . on sale in this country, more than one year prior to the date of the application for patent in the United States . . . .").

might turn on when the variation was first introduced and whether it was obvious at that time, even if the defendant had no connection with the party responsible for it. Competitor B's liability, in other words, might turn on the history of Competitor A, even if Competitor A was not a party to the case and Competitor B had not copied from anyone. The advantages of an obviousness-based equivalence inquiry, discussed in Part III, might be sufficient to justify these headaches, but I will suggest a further alternative that seems in some respects more practical, and perhaps best tailors the scope of the claim to the patentee's contribution to the art.

C. *A Semi-Symmetrical Alternative*

Another option would be to mix the time-of-filing and time-of-infringement perspectives to a certain extent, by asking whether, at the time the patent application was filed, a person of ordinary skill in the art, aware of the claimed combination and the substituted element, would have found it obvious to make the substitution. If the answer is yes, the substitution would result in an infringing equivalent. To return to the first example, one would ask whether, at the time the application was filed, a person of ordinary skill in the art, aware of the claimed amplifier circuit and of transistors, would have found it obvious to substitute a transistor for the vacuum tube. No actual person, of course, could have been aware of transistors at the time the patent application was filed; they had not been invented yet. The inquiry would be purely hypothetical, as it is when obviousness is addressed in a validity context based on references known to few, if any, persons skilled in the art.

The hypothetical knowledge of the substituted element – in this case transistors – makes the claim "future proof" in the sense that the discovery of new technologies peripheral to the claimed invention, and which require no ingenuity to substitute for a claim element, will not deprive the patentee of the protections to which the patentee seems reasonably entitled. If substituting a transistor for the vacuum tube would be obvious, once transistors were available, it would be considered equivalent. On the other hand, if something about the amplifier circuit would have made the substitution of transistors nonobvious, even if transistors had been available, then the substitution would not result in an equivalent. This would be true regardless of subsequent advancements in the art that led to greater understanding of the circuit. Returning to the second hypothetical, the substitution of the diode for the resistor would not result in an equivalent if it would not have been obvious at the time the patent application was filed (assuming knowledge of both the circuit design and of diodes), and it would remain nonequivalent even after Competitor A, through its improvement of the circuit, had added to the knowledge available in the art.

This hybrid test presents its own difficulties. One would have to distinguish between "knowing about transistors" and "knowing *everything* about transistors, including their suitability as a substitute in the patentee's amplifier circuit." If the latter kind of knowledge were assumed, then every substitution

would be obvious. These kinds of problems can be minimized by concentrating on the objective, which is to distinguish between improvements of the patented invention and tangential developments in related arts. The latter would include the invention of transistors – a tremendous advancement in their own right, but not created as an improvement for a particular amplifier circuit. Focusing on the *obviousness of the substitution* (e.g., replacing the vacuum tube in this circuit with a transistor), rather than the *obviousness of the substitute* (e.g., transistors in general) should reinforce this distinction while providing the "connectedness" previously discussed.[177] It would result in the consistent treatment of potential infringers, and protection for the patentee from unforeseen and peripheral developments in the art. At the same time, it would give the patentee "credit," so to speak, only for what the patentee contributed to the art. The patentee's territory would include the invention as explicitly claimed and substitutions that knowledge of the claimed invention made obvious to persons skilled in the art. It would not include further nonobvious improvements of the claimed invention. Rights to those improvements, if they were beyond the literal scope of the patentee's claims, would belong solely to those who discovered them.

III. THE MERITS OF A SYMMETRICAL DOCTRINE

Although the formal elegance of a symmetrical, or even semi-symmetrical, patent doctrine might be some justification for reconsidering how equivalence is measured, other issues are far more important. In the remainder of this Article, I will discuss the practical advantages of an obviousness-based inquiry, the concern that it would expand equivalency beyond a reasonable scope, its consistency with existing doctrine, and, finally, whether defining the boundaries of a patent in this manner would be supported by the leading economic theories of the patent system.

[177] *See supra* note 165 and accompanying text ("Most prior art references are theoretically available to anyone of skill in the art exercising ordinary diligence."). A potential substitute might be known at the time of filing, but seen as impractical because of cost, reliability or similar issues. As long as later improvements are peripheral to the claimed invention, one should assume knowledge of the *improved* substitute. For example, Merges and Nelson point out that MOS transistor technology was known when Texas Instruments filed its basic patent for the pocket calculator, but because it suffered from reliability problems few firms expected it to be used in such applications. Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 858 n.86 (1990). Merges and Nelson argue that "[t]hese are the very kinds of improvements that should be encouraged, not blocked by an overly broad pioneer patent." *Id.* However, advancements in MOS technology, which can be used in a variety of applications, seem peripheral to the calculator art. They may be worthy of encouragement, but perhaps by limiting the scope of patents on transistors, rather than by allowing opportunists who would simply substitute technology improved by others into a basic invention already conceived by Texas Instruments. *Id.*

A. *Practical Advantages*

The problems associated with the current analysis of equivalence, including the indefinable nature of substantial differences, have already been discussed.[178] In comparison, an obviousness-based inquiry promises a more definite, objective, and predictable measure of equivalence.[179]

As is the case when obviousness is a validity question, fact finders judging equivalence would have to picture themselves as different persons at a different time, and would have to imagine their reaction to the allegedly equivalent substitution. Would their mental state have been that of recognizing the obvious, or something closer to surprise? It would not be a simple task, at least in close cases, but various secondary considerations[180] might be called upon to aid in such an analysis. And, as in any infringement inquiry, the focus would be on the accused product. Let us return to the amplifier circuit hypothetical – the version where the diode substitutes for the resistor – to see what some of those considerations might be.

Long-Felt Need. The defendant's modified circuit might fulfill a need that the patentee's circuit, as literally claimed, did not. If the defendant's circuit, for example, could serve as a high-fidelity amplifier in a compact low-power music system (a need that the patentee's version of the circuit had failed to satisfy) this would be evidence that the substitution was nonobvious. Otherwise, other persons skilled in the art, including the patentee, should have effected the substitution first. One would discount this particular factor if the delay had been caused only by the unavailability of the substitute element (e.g., the transistor in the other hypothetical).

Praise and Skepticism. If the diode version of the circuit had received accolades in comparison to the resistor version, or if experts had expressed skepticism that it could be done at all (perhaps by advising against making the effort), this would support a finding of nonobviousness.

Commercial Success. If the defendant's product achieved a level of commercial success that eluded circuits built with the resistor, and if that success could be attributed to the substitution, that would also serve as evidence of nonobviousness.

Independent Development. To maintain consistency with *Warner-Jenkinson*,[181] infringement would not depend on whether the defendant had

[178] *See supra* Part I.C.5 (identifying the problems associated with the current analysis of equivalents).

[179] Cianfrani, *supra* note 7, at 16 ("An obviousness test [of equivalence] is no more certain than the 'insubstantial changes' test promulgated by the Federal Circuit."). Although either is uncertain, an obviousness test should provide *relative* certainty because of the more objective standard and the availability of secondary considerations.

[180] *See supra* Part I.B (identifying some secondary considerations, for example: commercial success, long-felt but unsolved needs, and the failure of others).

[181] *See supra* Part I.C.3 (identifying as immaterial the method by which a defendant arrives at an invention).

worked from the teachings of the patent or had proceeded independently. However, evidence that the incorporation of diodes in the alternative circuit design had required a substantial effort would be further objective evidence of nonobviousness.

Near-Simultaneous Invention. If similar substitutions of diodes for resistors had followed close on the heels of the patentee's filing date, this might serve as evidence that the substitution was obvious in the relevant time frame, and remained so thereafter.

Finally, the defendant might considerably strengthen its position by obtaining its own patent on the revised circuit. Because the new patent would carry a presumption of validity,[182] including a presumption of nonobviousness, it should carry great weight in the equivalence inquiry, particularly if issued by an examiner cognizant of the plaintiff's patent as prior art. It would, however, have to be clear that the defendant's claimed invention specifically related to the substitution, not to some other advancement.[183]

Accused infringers should be encouraged by the chance to mount a defense, at least with respect to the doctrine of equivalents, that emphasizes the success of their product and the ingenuity of their employees. Under the current standard of insubstantial differences, these things are of questionable relevance.[184] Potential defendants would also have more objective evidence at their disposal with which to judge the risks of designing around a patent claim or proceeding to litigation after they are accused of infringement. Of course, there would still be uncertainty, but the relevant issue – that of obviousness – would at least be one where an engineer or technician could offer useful insights. Today, a potential infringer can only ask a lawyer what "insubstantial differences" means, and the lawyer will be hard-pressed to answer. Because an obviousness standard is more definite than an insubstantial differences standard, it would save resources currently wasted through miscalculation, and fewer disputes would have to be resolved through costly litigation.

B. *Is Obviousness Overbroad?*

Potential defendants might not be as pleased as the preceding section suggests if they believed that replacing the insubstantial differences test with an obviousness standard expanded the scope of equivalence. There is something to be said for circumscribing equivalence as tightly as possible while being true to its rationale; if equivalence is an extraordinary event, and

[182] 35 U.S.C. § 282 (2000) ("A patent shall be presumed valid.").

[183] This potential defensive use of patents would also provide an additional incentive to file applications, leading to further disclosures and enrichment of the art.

[184] Today, the commercial success of the defendant's product is most likely to be used against it. It leads not only to higher damages awards but, potentially, to a conclusion that the *plaintiff's patent* is nonobvious, if the success of the defendant's product is attributed to its use of the patentee's invention. *See* Brown & Williamson Tobacco Corp. v. Philip Morris Inc., 229 F.3d 1120, 1130 (Fed. Cir. 2000).

patent claims mean almost (if not exactly) what they say, then concerns involving public notice and the proper examination of patent applications[185] are minimized. The rhetoric associated with the doctrine of equivalents – rhetoric which led to the insubstantial differences test – does suggest equivalence of very limited scope. The Supreme Court in *Graver Tank* referred to infringement by "minor variations," and "unimportant and insubstantial changes" that "add[] nothing," though they avoid copying "every literal detail" of the claimed invention.[186] "[T]rivial changes" is a phrase employed in *Festo*.[187] Equivalence based on obviousness may seem broader than this; alternatives obvious to a person skilled in the art may include some that are more than "trivially" different.

One response to this concern is that, already, the reality does not always follow the rhetoric. It is not a "trivial" difference to control a spacecraft through on-board computers rather than ground-based signals.[188] Digital computers are not so much like analog computers that they "add nothing."[189] In *Texas Instruments, Inc. v. U.S. International Trade Commission*,[190] the Federal Circuit held that the totality of changes between the plaintiff's pioneering pocket calculator and later imported versions were sufficient to find them nonequivalent.[191] But the court hinted that any of the changes, in isolation, might have been equivalent, even though they included noteworthy technological advancements – changes from thermal printers to liquid crystal displays, bipolar to MOS transistors, and so forth.[192] That the replacements were clearly superior did not itself preclude infringement.[193] In some cases, stark differences are discounted because they are unimportant in the context of the patent, something that should already shake the confidence of a potential defendant intending to rely, for example, on technological superiority to

[185] *See supra* Part I.C.5 (identifying public notice and proper examination of patents as problems associated with the classical equivalents determination).

[186] 339 U.S. 605, 607 (1950).

[187] Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 733 (2002).

[188] *See* Lemley, *supra* note 20, at 1006 (referring to on-board navigation as a "dramatic" improvement that "revolutionized satellite technology").

[189] *Id.*

[190] 805 F.2d 1558 (Fed. Cir. 1986).

[191] *Id.* at 1570 ("Taken together, these accumulated differences distinguish the accused calculators from that contemplated in the ´921 patent and transcend a fair range of equivalents of the ´921 invention.").

[192] *See id.* at 1570-71 ("Each individual difference, standing alone, could conceivably lead to a different result, [*i.e.*, a finding of equivalence] by application of this court's precedent.").

[193] *See id.* at 1568 ("As a matter of law, subsequent improvements do not in themselves preclude a finding of infringement.").

demonstrate nonequivalence. Indeed, even a *patented* difference is not guaranteed to be a substantial difference.[194]

Furthermore, if an obviousness test did expand equivalence in some respects, it would narrow equivalence in others. Under the current articulation of the standard, if a substitute *turned out* to perform substantially the same function in substantially the same way to achieve substantially the same result, it could be found equivalent when judged at the time of the infringement, even if the results were unexpected. Consider the situation in *Warner-Jenkinson*, where the defendant's dye purification process did not literally infringe because it was performed at a pH of 5.0, instead of the required pH level of "approximately 6.0 to 9.0."[195] The reason for the lower limit in the claim was unclear, but may have been because the patentee expected the process to be spoiled by foaming.[196] Under the obviousness test proposed in Part II, the defendant's process would be found nonequivalent if, at the time the patent application was filed, concerns over foaming would have prevented persons of ordinary skill in the art from regarding the lower pH as an obvious alternative. Under the insubstantial differences test, the defendant's process might be found equivalent if foaming, after all, was not the problem it was expected to be.

That an obviousness standard would, in some respects, contract the scope of equivalence can be further appreciated by considering the effect of a patent obtained by the defendant on its variation. If the patent specifically related to the substitution, the defendant would be in a strong position to argue nonobviousness/nonequivalence. Under the insubstantial differences approach, the defendant might hope that the patent would be given "due weight,"[197] but its relevance would be far less clear.

Finally, the scope of equivalence is not entirely a matter of the test employed. Under any standard, equivalence can be severely limited by prosecution history estoppel, the prior art, and the disclosure of unclaimed embodiments.[198] One could limit equivalence even further by excusing the failure to claim subject matter explicitly only when the patentee had no

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[194] *See, e.g.*, Fiskars, Inc. v. Hunt Mfg. Co., 221 F.3d 1318, 1324 (Fed. Cir. 2000) ("[I]t is well established that separate patentability does not avoid equivalency as a matter of law . . . ."); Nat'l Presto Indus., Inc. v. West Bend Co., 76 F.3d 1185, 1192 (Fed. Cir. 1996) ("The fact of separate patentability is relevant, and is entitled to due weight. However, West Bend's statement that there can not be infringement as a matter of law is incorrect."); Atlas Powder Co. v. E.I. Du Pont de Nemours & Co., 750 F.2d 1569, 1580 (Fed. Cir. 1984) (holding that the grant of a patent to an alleged infringer does not constitute prima facie evidence of non-equivalence).

[195] *See supra* notes 118-124 and accompanying text.

[196] *Warner-Jenkinson*, 520 U.S. at 22 n.2.

[197] *See Nat'l Presto*, 76 F.3d at 1192 ("The fact of separate patentability is relevant and is entitled to due weight.").

[198] *See supra* Part I.C.4 (identifying prosecution history estoppel, the prior art, and the disclosure of unclaimed embodiments as limitations on equivalence).

alternative – when, in other words, the vocabulary did not exist to describe the alternative later alleged to be equivalent, or where the element later substituted did not exist when the application was filed and could not have been foreseen.[199] A finding of equivalence could be a very rare event, perhaps limited to situations much like the hypothetical where the patentee could not predict the invention of the transistor. In any case, there is nothing about an obviousness standard which would mandate a doctrine of equivalents run rampant.

C. *Consistency with Precedent*

In *Atlas Powder Co. v. E.I. Du Pont de Nemours & Co.*,[200] defendant Du Pont manufactured an explosive employing sodium oleate, formed *in situ*, as an emulsifying agent.[201] The plaintiff's patent, by its literal terms, required a different emulsifying agent.[202] Du Pont pointed out that its own product, and the process of producing it *in situ*, had been patented.[203] This, argued Du Pont, should serve as *prima facie* evidence that its product and the plaintiff's were nonequivalent.[204] The Federal Circuit disagreed.

The court premised its conclusion on a comparison to literal infringement. If a patent claims the combination A + B + C, a defendant selling A + B + C + D infringes.[205] If, for example, the patentee claims a combination of elements that together form a mousetrap, the defendant still infringes if it sells the same combination of elements but adds a bell. By the same token, the court held, if the patentee claims A + B + C and the defendant sells A + B + C' (C' being an "equivalent" of C), the defendant still infringes, even if A + B + C' were patented.[206] Whether Du Pont makes A + B + C + D or A + B + C', Du Pont

[199] In *Festo*, the Supreme Court placed an equivalent burden on the patentee in the context of prosecution history estoppel: "The patentee must show that at the time of the amendment one skilled in the art could not reasonably be expected to have drafted a claim that would have literally encompassed the alleged equivalent." 535 U.S. 722, 741 (2002). In *Johnson & Johnston*, Judge Rader's concurring opinion suggested a more general rule limiting equivalents to variations that the patentee, when drafting the claims, could not have foreseen. 285 F.3d 1046, 1056 (Fed. Cir. 2002) ("The reconciling principle is simple: the doctrine of equivalents does not capture subject matter that the patent drafter reasonably could have foreseen during the application process and included in the claims.").

[200] 750 F.2d 1569 (Fed. Cir. 1984).

[201] *Id.* at 1572 ("The team succeeded in making a water-in-oil emulsion blasting agent which Du Pont began making and selling in August 1978.")

[202] *Id.* at 1579.

[203] *Id.* at 1580.

[204] *Id.*

[205] *Id.* ("Dupont concedes that, if Atlas patents A + B + C and Du Pont then patents the improvement A + B + C + D, Du Pont is liable to Atlas for any manufacture, use, or sale of A + B + C + D . . . .").

[206] *Id.* (holding that Du Pont infringes if its product contains an equivalent or an additional new piece).

has used the gist of Atlas' invention to devise a patentable composition. Accordingly, there is no compelling reason to hold Du Pont liable for infringement in one instance but not in the other.[207]

The court's lack of interest in Du Pont's patent suggests that a variation can be nonobvious but still equivalent. However, a few things in the court's opinion are worth noting. First, the logic has an element of tautology. Du Pont, in the court's words, urged it to find the patented A + B + C' noninfringing "even though A + B + C' is 'equivalent' to A + B + C."[208] Of course it infringes if it is "equivalent"; a better way to frame the argument would be to say that if there are patentable differences, the variation is *not* equivalent at all. The comparison to literal infringement is also suspect. If the patentee claims A + B + C, and the claim is not in the rare form that limits the patentee to these elements *and no others*,[209] then A + B + C + D is precisely what the patentee claimed. That Du Pont combined A + B + C' *contrary* to the requirements of the claim might be regarded as a "compelling reason" to contemplate a different result. In support of its argument, the court quotes a Sixth Circuit opinion from 1911:

> Another reason sometimes advanced for supposing that the structure of the second does not infringe the claim of the first patent is that the Patent Office has declared that a patentable difference exists. The premise is sound, but not the conclusion. In examining the second application, the Patent Office has no concern with the scope of the claim of the first, and does not and must not pay any attention thereto. It is concerned only with the early disclosure by the specification and drawings. Patentable difference does not of itself tend to negative infringement. It may just as well be based upon infringement, plus improvement; and improvement may lie in addition, simplification, or variance.[210]

This reasoning makes sense as applied to literal infringement. If the Patent Office were considering the patentability of A + B + C + D, it would compare this combination to the teachings of the earlier patent, best communicated in the preferred embodiments. The scope of the earlier claim A + B + C would be immaterial to the validity of the later claim. An improver who makes a nonobvious addition to a prior combination is entitled to a patent, even though the second patent is dominated by the claims of the first. The result is a case of

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[207] *Id.*

[208] *Id.*

[209] Claim preambles typically end with the word "comprising," which means that a product is within the scope of the claim if it includes the claim elements listed, alone or in combination with additional elements. *See* Carl Zeiss Stiftung v. Renishaw PLC, 945 F.2d 1173, 1178 (Fed. Cir. 1991) (holding that a claim is not limited to "devices containing *only* the structures of the embodiments specifically described in the specification").

[210] Herman v. Youngstown Car Mfg. Co., 191 F. 579, 585 (6th Cir. 1911). The court in *Herman* appears to be focusing on *literal* infringement, where there is no contradiction between the patentability of the defendant's product and its infringement of an earlier claim.

blocking patents; neither party can practice A + B + C + D without the permission of the other.[211] The situation of A + B + C' is somewhat different. The Patent Office would still concern itself with the teachings of the first patent, rather than the claims, but this is comparable to what a court does later when considering the doctrine of equivalents. The court looks past the words of the claim, seeking instead the essence, or as the *Atlas Powder* opinion says, the "gist" of the invention: something the claims could not convey precisely, but that is implicit in the teachings of the patent. Hence, the kind of comparison that occurs when the Patent Office considers patentability is much closer to a doctrine of equivalents analysis than it is to a literal infringement inquiry. To find a difference equivalent when the Patent Office has found the same difference patentable appears contradictory.[212]

If *Atlas Powder* seems inconsistent with a measure of equivalence based on obviousness (due to the court's dismissal of Du Pont's patent), subsequent Federal Circuit precedent is more accommodating. On various occasions, the court has treated the patentability of the defendant's variation as relevant to the substantiality of the differences and entitled to "due weight" in an equivalence inquiry.[213] To admit even the relevance of the defendant's patent signals a departure from *Atlas Powder*; if the substitution of an equivalent element were no different than adding to the elements literally claimed, then the defendant's patent would logically have no relevance whatsoever. To make obviousness the *determinative* factor under the doctrine of equivalents would require the Federal Circuit to go further.

In *Roton Barrier, Inc. v. Stanley Works*,[214] Judge Nies, in a concurring opinion, expressed her readiness to "apply nonobviousness as the test for [an] 'insubstantial change.'"[215] Echoing the algebraic language of *Atlas Powder*, she wrote:

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[211] *See* Lemley, *supra* note 20, at 1009-10 ("Should the original patent owner try to use the patented improvement, the significant improver can sue *him* for damages and an injunction. This situation is known as the case of 'blocking patents.'"); Merges & Nelson, *supra* note 177, at 860-61 (explaining that neither the "dominant" nor the "subservient" patent owner are capable of selling its product without a license from the other party).

[212] The court admits that a patent based on "unexpected results" would be relevant to equivalence. *Atlas Powder Co.*, 750 F.2d at 1580 n.3 ("Of course, if A + B + C' were patented because of unexpected results, those unexpected results might prompt a finding of no equivalence."). Then the accused combination would produce a "substantially different result" under the *Graver Tank* tripartite test of equivalence. One might wonder how a patent could be granted in a case of "expected results," but apparently the Du Pont combination, even if patentably different, produced results similar to those achieved by the first patentee.

[213] Nat'l Presto Indus., Inc. v. West Bend Co., 76 F.3d 1185, 1192 (Fed. Cir. 1996); *see also* Zygo Corp. v. Wyko Corp., 79 F.3d 1563, 1570 (Fed. Cir. 1996) ("The nonobviousness of the accused device, evidenced by the grant of a United States patent, is relevant to the issue of whether the change therein is substantial.").

[214] 79 F.3d 1112 (Fed. Cir. 1996).

[215] *Id.* at 1128 (Nies, J., Additional Views).

> If the second patent requires practice of the first i.e., the second merely adds an element "D" to a patented combination A+B+C, the combination A+B+C+D clearly infringes. Conversely, if the second patent is granted for A+B+D over one claiming A+B+C, the change from C to D must not have been obvious to be validly patented. Evidence of a patent covering the change, in my view, is clearly relevant unless the patent is invalid. *A substitution in a patented invention cannot be both nonobvious and insubstantial*.[216]

The Supreme Court has encouraged the Federal Circuit to devise its own linguistic framework for the equivalence analysis.[217] A shift from an insubstantial differences test, as it is currently applied, to an obviousness test involves more than a choice of vocabulary, but it is worth considering whether the Supreme Court's own precedent would support or preclude the approach suggested by Judge Nies.

The oldest Supreme Court cases precede the adoption of nonobviousness as the standard of patentability. Had the timing been reversed, one wonders if obviousness would have been the test originally associated with the doctrine of equivalents. In *Winans*, the Court, discussing "change[s] of form," suggests a symmetry between the standard of patentability and the standard of equivalence. Putting words in the mouth of a hypothetical patentee, the Court states:

> [M]y improvement did not consist in a change of form, but in the new employment of principles or powers, in a new mode of operation, embodied in a form by means of which a new or better result is produced; it was this which constituted my invention; this you have copied, changing only the form; and that answer is justly applicable to this patent.[218]

In other words, more than a "change of form" is necessary to secure a patent, and more than a "change of form" is necessary to avoid infringement. The Court also refers to "the substance of the invention," identified as "that which entitled the inventor to this patent" and which, if found in an accused product, mandates a finding of infringement.[219] On the other hand, the Court describes an infringing equivalent as one similar enough to "substantially . . . embody the patentee's mode of operation" and "attain the same kind of result" – language more reminiscent of a substantial differences test than an obviousness test.[220]

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[216] *Id.* (emphasis added).

[217] Warner-Jenkinson Co. v. Hilton Davis Chem. Co., 520 U.S. 17, 40 (Fed. Cir. 1997) ("We expect that the Federal Circuit will refine the formulation of the test for equivalence in the orderly course of case-by-case determinations . . . .").

[218] Winans v. Denmead, 56 U.S. 330, 343 (1853).

[219] *Id.*

[220] *Id.* at 344.

Graver Tank also precedes the explicit adoption of an obviousness test of patentability. Although the Court did not use the word "obvious" to describe changes that are unimportant or insubstantial, the decisive evidence, interestingly, turns as much on the knowledge or understanding of persons skilled in the art, as it does on the differences themselves.

It is difficult to conceive of a case more appropriate for application of the doctrine of equivalents than *Graver Tank*. The disclosures of the prior art made clear that manganese silicate was a useful ingredient in welding compositions. Specialists familiar with the problems of welding compositions understood that manganese was equivalent to and could be substituted for magnesium in the composition of the patented flux and their observations were confirmed by the literature of chemistry.[221]

What seems important in *Graver Tank* is not just the similarity of manganese and magnesium, but the extent to which that similarity was already known to the art and available to be exploited. The objective factor emphasized in *Graver Tank* and many subsequent cases is whether the defendant used a *known* substitute for the element literally claimed.[222] The Court notes an absence of evidence that the defendant had developed its alternative "as the result of independent research or experiments"[223] – further evidence that the substitution of manganese was a *known* alternative. *Graver Tank* leaves much room for interpretation, but it seems that equivalence depends not just on whether A is similar to B, but also on whether the substitution of A for B is already routine or whether it requires a further advancement in the art. Perhaps the result in *Graver Tank* would have been different if the defendant, with much ingenuity and to the general surprise of the art, had *discovered* that magnesium and manganese perform substantially the same function, in substantially the same way, to achieve substantially the same result.

In *Warner-Jenkinson*, the Court again emphasizes the important role of knowledge in deciding what is equivalent. Independent experimentation by the defendant is relevant, the Court holds, not because copying is required to infringe, but because if the defendant already knows that A can substitute for B, without having to experiment, others skilled in the art may possess the same knowledge.[224] On the other hand, the Court states that "a skilled practitioner's knowledge of the interchangeability between claimed and accused elements is not relevant for its own sake, but rather for what it tells the fact finder about

[221] Graver Tank & Mfg. Co., Inc., v. Linde Air Prods. Co., 339 U.S. 605, 612 (1949).

[222] *Id.* at 609 ("An important factor is whether persons reasonably skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was.").

[223] *Id.* at 611.

[224] Warner-Jenkinson Co. v. Hilton Davis Chem. Co., 520 U.S. 17, 36 (Fed. Cir. 1997) ("The need for independent experimentation thus could reflect knowledge – or lack thereof – of interchangeability possessed by one presumably skilled in the art.").

the similarities or differences between those elements."[225] The Court's reasoning here is opaque. If the differences between A and B are what is really important, those differences exist whether anyone is aware of them or not. Purifying dyes at a pH of 5.0 either produces the same result as a higher pH level or a different result. Proof of a similar result could be in the form of experiments long-known in the art or a new test conducted specifically for purposes of the litigation. How, then, is *known* interchangeability relevant at all? The Court's only explanation is that "the perspective of a skilled practitioner provides content to, and limits on, the concept of 'equivalence.'"[226] How it does this is unclear. The skilled practitioner's "perspective" by itself provides no content or limitation if the standard is "insubstantial differences."[227] If obviousness were the standard for equivalence, the importance of the skilled practitioner's perspective and knowledge would be much easier to understand. Ultimately, the Court did not choose any particular standard, other than the unhelpful "essential inquiry: Does the accused product or process contain elements identical or equivalent to each claimed element of the patented invention?"[228]

While the *Festo* decision is no more illuminating on this issue, it characterizes an invention as an idea – a concept that, on occasion, cannot be captured in words, but that others skilled in the art are capable of understanding and, if the law is inflexible, exploiting.[229] Sometimes language cannot adequately describe "the range of [the invention's] novelty."[230] If the reason for the doctrine of equivalents is, in the words of *Festo*, "language's inability to capture the essence of innovation"[231] – an essence coincident with the "range of its novelty" – a logical corrective would be an obviousness standard of equivalence. A patent disclosure contributes to the art whatever it communicates explicitly *and* whatever it renders obvious in the context of information already available. That penumbra of obviousness may be the hardest part of the contribution to capture in claim language, but it is still within the bounds of the invention. In contrast, a modification requiring further inventive effort exceeds the patentee's contribution to the art, and

[225] *Id.* at 37. The perspective from which to judge equivalence, and hence knowledge of interchangeability, is the time of the alleged infringement. *Id.* ("[T]he proper time for evaluating equivalency . . . is at the time of infringement . . . .").

[226] *Id.*

[227] *See supra* notes 152-153 and accompanying text.

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

[229] Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 731 (2001) ("Unfortunately, the nature of language makes it impossible to capture the essence of a thing in a patent application. The inventor who chooses to patent an invention . . . bears the risk that others will devote their efforts toward exploiting the limits of the patent's language.").

[230] *Id.*

[231] *Id.* at 734.

perhaps the patentee's ability to argue that the essence of the invention remains.

In short, adopting obviousness as the standard of equivalence would require some adjustments, but not necessarily a wholesale revision of existing doctrine. Both the insubstantial differences test and the tripartite function/way/result test could still play a useful role. If there are important differences between A and B in function, way, or result, it is less obvious to substitute A for B. However, the differences between A and B would shed light on the obviousness of the substitution, not the other way around. If this reverses current practice, it also adds a degree of logic. The particular obviousness test suggested in Part II judges the obviousness of the substitution as of the time the patent application was filed, contrary to the current rule that looks to the time of the alleged infringement.[232] Yet once the rule is qualified by assuming knowledge of the substituted element, this difference also may not be as important as it would first appear.

D. *Consistency with Theory*

The classic economic theory of patent law, recognizable in the constitutional language "to promote the Progress of Science and useful Arts,"[233] is reward theory.[234] When an inventor produces a technological advancement that is new, useful, and nonobvious, the inventor's "reward" is an exclusive right to make, use, or sell the invention – a right that may translate into supra-competitive profits, if the invention has no ready substitutes in the marketplace. Any monopoly imposes costs on society,[235] but the reward theory postulates that these costs are more than outweighed by the benefits of innovation. Without the protection of exclusive rights, inventors would fear that the fruits of their labor would be enjoyed by others, leading to reduced investments in technological advancement.[236]

The doctrine of equivalents can be justified as a guardian of the inventor's reward. If, as the Supreme Court suggested in *Festo*, language, through no

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[232] *See Warner-Jenkinson*, 520 U.S. at 37 ("[T]he proper time for evaluating equivalency – and thus knowledge of interchangeability between elements – is at the time of infringement, not at the time the patent was issued.").

[233] U.S. CONST. art. I., § 8, cl. 8.

[234] *See* Mark F. Grady & Jay I. Alexander, *Patent Law and Rent Dissipation*, 78 VA. L. REV. 305, 310 (1992) (identifying reward theory as a more traditional method of understanding patent law); Lemley, *supra* note 20, at 993 ("While there are a number of noneconomic theories offered to explain both copyright and patent law, both the United States Constitution and judicial decisions seem to acknowledge the primacy of incentive theory in justifying intellectual property.").

[235] *See supra* notes 15-19 and accompanying text.

[236] *See* Cotropia, *supra* note 9, at 169-70 ("Without the ability to control the invention, the inventor could not demand the price for her invention needed to recoup her costs and turn a profit.").

fault of the patentee, sometimes fails to capture the essence of an invention, inventors will be denied their reward if they are limited to the precise language of the claims. By substituting an equivalent, rivals could use the teachings of the patent – the product of the patentee's labor – to compete with the patentee in the marketplace. That competition may deny the patentee expected profits, or even a chance to recoup the costs of the invention. Should this happen too often, inventors would find innovation so unprofitable that the technological arts would languish.[237]

If this is the essential function of the doctrine of equivalents, an obviousness standard has a definite appeal. The reward associated with a patent should be commensurate in scope with the inventor's contribution to the art,[238] a contribution which includes obvious variations of what the patentee claimed. Those obvious variations, by definition, are a part of what a patentee puts within the reach of any person of ordinary skill. If their rights did not extend to those variations, patentees would be exposed to the hazards described above; competitors could use the teachings of the patent to develop, at the patentee's expense, rival products to undermine the patentee's profits. On the other hand, competitors who develop *non*obvious variations of the patentee's invention are not exploiting the teachings of the patent to the same extent.[239] They are, in fact, advancing the art themselves, according to the same standard applied to the patentee. They, perhaps, should be entitled to enjoy their own reward, without owing anything to the patentee whose claims they do not literally infringe.[240]

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[237] *See* Lemley, *supra* note 20, at 994 ("In a private market economy, individuals will not invest in invention or creation unless the expected return from doing so exceeds the cost of doing so – that is, unless they can reasonably expect to make a profit from the endeavor.").

[238] *See* Merges & Nelson, *supra* note 177, at 913 ("It is basic to the grant of a patent that the scope of the patent should not exceed the scope of the invention.").

[239] In *In re* Fisher, 427 F.2d 833, 839 (C.C. Pa. 1970), the court observed that a patentee "should be allowed to dominate the future patentable inventions of others where those inventions were based in some way on his teachings." Even if the improvements are nonobvious, they are "still within [the patentee's] contribution, since the improvement was made possible by his work." *Id.* However, to borrow Professor Merges's analogy, an earlier invention is only the "but-for cause" of nonobvious improvements, not the "proximate cause." *See* Robert M. Merges, *Rent Control in the Patent District: Observations on the Grady-Alexander Thesis*, 78 VA. L. REV. 359, 363 n.15 (1992). Hence, whether the argument is based on fundamental fairness or the tailoring of the economic incentive, the case for dominating nonobvious improvements is a weaker one, particularly when those improvements are beyond the scope of what the patentee claimed explicitly.

[240] "Patent law must consider the impact of maintaining the incentive for one inventor on the incentives for potential inventors to follow – those who will be building from, or improving upon, the initial invention." Cotropia, *supra* note 9, at 179. Improvers may hesitate to proceed if they face the prospect of infringing an earlier patent. *Id.* at 182 ("Almost every inventor is following another's technological development, and protection for after-arising equivalents deters these follow-on inventions."). An improver who could obtain a patent on the improvement would have some leverage for bargaining with the

Alternative theories of patent law focus less on the patent reward as a spur to creativity and more on the efficient use of resources to exploit a particular innovation. Edmund Kitch's "prospect theory" is of this type.[241] Kitch compared a patent to the territory allotted to a prospector who stakes a claim. The effect of granting an exclusive right is to put in the hands of one party the task of organizing the efficient exploration of the land.[242] Without that control, wasteful duplication could occur as numerous prospectors, not all of whom will succeed, rush to exploit the treasure. Or the prospector who first suspected the presence of gold in the hills might expend needless resources on keeping the discovery a secret.[243] He might hesitate to deal with those who could most efficiently find or extract the gold, fearing they would take the treasure for themselves.[244] The rights associated with the prospector's claim prevent these inefficient outcomes. Similarly, patents allow a single party – the inventor – to organize the exploitation of the invention with a minimum of waste.[245]

Generally speaking, Kitch's prospect theory supports generous patent rights. A broader patent means a larger territory protected from the evils of inefficient exploitation. In an influential article, Robert Merges and Richard Nelson voice skepticism of Kitch's theory, particularly if the patentee's rights are so broad that they encompass significant improvements to the basic invention.[246] Competition, they argue, provides the most effective incentive for rapid and

original patentee, because neither could practice the improved invention without the permission of the other. *See id.* at 198-99 ("The follow-on inventor, can, in this instance, use her patent to block the existing patentee from practicing her development, forcing a bargaining situation."); Lemley, *supra* note 20, at 1009-10 ("The original patent owner can prevent the improver from using his patented technology, but the improver can also prevent the original patent owner from using the improvement."). However, the improver who will owe nothing to the original patentee has a stronger incentive.

[241] *See* Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 265 (1977) ("This essay argues that the patent system performs a function not previously noted: to increase the output from resources used for technological innovation.").

[242] *See id.* at 276 ("[A] patent 'prospect' increases the efficiency with which investment in innovation can be managed.").

[243] *See id.* at 279 ("A patent system covering all the useful arts provides a uniform structure of incentives without regard to the possibility of economic exploitation in secret.").

[244] *See id.* at 277-78 (identifying the practical difficulties of entering into contracts to preserve trade secrets).

[245] *See* Grady & Alexander, *supra* note 234, at 314 ("Both systems . . . lower the claimant's cost of maintaining control over the valuable discovered resource."); Lemley, *supra* note 20, at 1046 ("[T]he primary point of the patent system is *to encourage further commercialization and efficient use* of as yet unrealized ideas by patenting them, just as privatizing land will encourage the owner to make efficient use of it.").

[246] Merges & Nelson, *supra* note 177, at 843 ("However, contrary to what Kitch suggests, we do not *presume* that granting broad scope to an initial inventor induces more effective development and future invention.").

creative improvement.[247] The benefits to society of more vigorous exploration outweigh any waste that may occur. Consequently, Merges and Nelson advocate an infringement analysis that permits rivals of the patentee substantial freedom to improve upon the claimed invention. They suggest, for example, a symmetrical approach to infringement which takes into consideration the magnitude of the technological advancements embodied in the accused product.[248]

An equivalence standard based on obviousness would do exactly that. Obvious variations of the claimed invention – variations that require little in the way of additional development because they are, indeed, obvious – would fall within the scope of the patent. Within that territory, the patentee could manage the efficient exploitation of the invention. Beyond the realm of obvious variations, where further inventive effort is required, the rivalry that Merges and Nelson see as essential to technological advancement would have free rein. Choosing obviousness as the cut-off, rather than an improvised measure like "significant improvement" or "radical improvement,"[249] has clear advantages. It is a standard already familiar in patent jurisprudence, it is

[247] *Id.* at 843-44, 877 (arguing that, at the margin, the law should favor a competitive environment to promote efficiency); Merges, *supra* note 239, at 372-73 ("Invention of improvements, like all invention, is an expensive and unpredictable activity, and the more approaches that are tried the more likely it is that the technical advances will be made."). Although even monopolists have incentives to innovate, competition offers both the "carrot" of success and the "stick" of failure at the hands of a more industrious rival. *See* Merges & Nelson, *supra* note 177, at 872 ("For one thing, under rivalrous competition in invention and innovation there is a stick as well as a carrot."). Competition also means that more creative minds are working on the same problems, perhaps exploring different paths. *See id.* at 873-74 ("But we would expect a single rightholder to *underdevelop* – or even ignore totally – many of the potential improvements encompassed by their broad property right."). Oddi calls the Merges and Nelson approach the "race-to-invent" theory, based on the premise that "faster is better." Oddi, *supra* note 1, at 282.

[248] Merges & Nelson, *supra* note 177, at 910 ("The equivalents inquiry . . . should be centered around whether the improved structures of the accused device show major differences from the structures disclosed in the original specification."). The source of the "symmetry" to which they refer is the increased scope of equivalents afforded to "pioneer patents" – patents on technological breakthroughs inaugurating entirely new fields of endeavor. *See* Sun Studs, Inc. v. ATA Equip. Leasing, Inc., 872 F.2d 978, 987 (Fed. Cir. 1989) ("The wide range of technological advance between pioneer breakthrough and modest improvement accommodates gradations in scope of equivalency."). The reason for the increased scope may be simply that equivalence, in the case of a pioneer patent, is less hemmed in by the prior art. *See* Abbott Labs. v. Dey, L.P., 287 F.3d 1097, 1105 (Fed. Cir. 2002) (holding that, in the absence of constraining prior art, pioneers acquire broader claims than non-pioneers).

[249] *See* Lemley, *supra* note 20, at 1007-08 (describing the differing treatments of significant improvers and minor improvers under patent doctrine); *see also* Cotropia, *supra* note 9, at 183 (discussing how a radical improvement will not infringe because it falls outside of the range of equivalents).

accompanied by useful and well-established "secondary considerations," and it is the one measure of inventiveness fundamental enough to have been incorporated in the Patent Act itself. If nonobviousness is the price of receiving a patent, there is a certain logic in making it also the price of avoiding another patent, at least insofar as the doctrine of equivalents is concerned.[250]

Grady and Alexander refined Kitch's prospect approach by analyzing the dangers of "rent dissipation."[251] By "rent" they meant the difference in value between the costs associated with producing and commercializing an invention, and the ultimate value of that invention to society.[252] The inventor's opportunity to pocket that difference, by charging for the use of the invention, is the "reward" that spurs innovation.[253] Society comes out ahead as long as the resources consumed in inventive activities are less than the benefits received; to put it in prospecting terms, as long as the costs associated with a prospector and his burrow are less than the value of the gold he discovers. The rent is "dissipated," and the value of the discovery to society undermined, if the promise of reward attracts the expenditure of too many resources.[254] If too many prospectors head into the hills, the aggregate costs may meet or exceed the value of what they could discover.[255] Similarly, the costs of too many researchers in too many laboratories could exceed the value of the inventions they might develop, or at least consume the rent that makes exploration worthwhile.[256]

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[250] A defendant's patent does not prevent literal infringement because *additions*, even additions that may be patentable, do not prevent the defendant's product from falling within the previously claimed genus. Patentable *changes* are another matter. *See supra* Part III.C (concluding that an addition does not prevent infringement).

[251] Grady & Alexander, *supra* note 234, at 308 ("The defect in [rent dissipation] is that if multiple inventors expend resources in competition for the patent monopoly, the benefit to society of having the invention will be dissipated by the cost of numerous, redundant development efforts."); *see also* Merges, *supra* note 239, at 370-71 (concluding that a danger posed by rent dissipation is wasteful duplication).

[252] Grady & Alexander, *supra* note 234, at 308 ("The difference between what society would pay for an innovation and its actual cost of development – the rent – is awarded to the inventor in the form of a monopoly right . . . .").

[253] *See id.* at 308 (claiming that if rent was not awarded to the inventor, "competition by imitators would discourage innovation by making it unprofitable").

[254] *Id.* at 307-08 ("In the perverse equilibrium that would result from a system awarding full control to the inventor who is first, the cost of developing dreams that ultimately fail would equal or exceed the benefit to society of those that succeed.").

[255] *See id.* at 314-15 ("In a gold rush, however, a single lucky prospector wins big, and then society loses as follow-on prospectors bid resources from higher valued uses outside the prospecting industry to lower valued ones inside it.").

[256] *See id.* at 308 (characterizing as "redundant" the efforts of too many researchers attempting to patent the same invention simultaneously).

Critics of Kitch's theory have observed that the excess expenditure of resources can occur *before* the prospector, or inventor, stakes a claim.[257] If claims are highly valuable, as they would be if afforded the broad reach that Kitch's analysis suggests, then there could be wasteful rivalry on the part of those seeking to be first to stake a claim. Perhaps too many resources would be spent on basic research, in the hopes of finding patentable inventions.[258] Hence, even if one emphasizes the efficient organization of resources rather than the healthy psychological effects of competition, determining the optimal scope of a patent means balancing the post-invention rent dissipation that occurs when rights are too narrow against the pre-invention rent dissipation that occurs when rights are too broad.

Grady and Alexander emphasize the effects of "signaling" in striking the most advantageous balance.[259] Even breakthrough inventions, they argue, receive little in the way of patent protection if they are so perfect, so "elegant," that they suggest or "signal" little in the way of potential improvement.[260] In those cases, the dangers of post-invention inefficiency are minimal; the invention is done, and there is no further exploration to manage. If rights were granted to those elegant inventions, they would be so valuable as to encourage the wasteful expenditure of pre-invention resources. In contrast, patent rights are broadest where the invention is least perfected.[261]

Even if one does not accept the counterintuitive proposition that the most perfect inventions should receive the least reward, the concept of signaling is worth considering. The potential improvements most clearly signaled by a patent are the obvious improvements. Those, by definition, are recognizable to anyone of ordinary skill, and are ripe for the picking.[262] If these strongly-

[257] *See id.* at 316-17 (identifying several academics who argue that "a competition for the right to develop prospects would completely dissipate the rents from innovations").

[258] *See id.* at 306 (explaining that patents "encourage hopeful inventors to squander valuable social resources in the race to win the patent").

[259] *Id.* at 309 (identifying signaling as a means of preserving rewards for innovation while controlling innovation's distorting effects).

[260] Grady and Alexander claim that they are explaining what the courts have done, rather than advocating what they *should* do. *See id.* ("At its core, our theory seeks to identify an underlying unity that explains the seemingly disorderly patent results.").

[261] *See id.* at 320-21 ("As the value of the invention increases, the case for patentability weakens because the large monopoly rent conferred on the inventor tends to encourage rent dissipation at the preinvention stage . . . ."); Oddi, *supra* note 1, at 289 ("Accordingly, rent dissipation would seem to suggest a narrow scope of protection for low benefit/cost (detail) inventions, because most of the improvements have presumably already been signaled.").

[262] Some who have commented on the Grady & Alexander thesis wonder how to tell whether an invention signals the potential for improvement or does not. *See* Oddi, *supra* note 1, at 285 ("One also would be suspicious of a counter-intuitive theory that predicts the invalidity of a patent on an elegant invention (categorized as being unimprovable) and that predicts validity of a patent on an inelegant (detail) invention because it somehow signals

signaled alternatives are not within the scope of the patent but still valuable, one can expect resources to be spent by rivals in their development.[263] These expenditures may be wastefully duplicative if beyond the patentee's ability to manage, and they cannot be as easily justified; because the development of obvious variations does not rise to the level of invention, there is less need for the invigorating effects of rivalry. In short, if efficiency is the chief concern in delineating the scope of equivalence, obviousness seems as good a place as any to draw the line.

CONCLUSION

Whether one views the doctrine of equivalents as an enlightened policy or a maddening contradiction, it is clear that it will be a part of patent doctrine for many years to come. It would be less problematic if it were not so frustratingly imprecise, a problem that can be attributed, in large measure, to the elusive standard of insubstantial differences. If an obviousness standard of equivalence seems less anchored to the literal claim language, the difference is more theoretical than real, given how broadly "insubstantial" can be interpreted. An obviousness standard would be comparatively objective, and it would make available various "secondary considerations" to assist the fact finder – what was "sauce for the goose," when the issue was validity, becoming "sauce for the gander," when the issue is equivalence. An obviousness standard would match well with the rationale for the doctrine of equivalents, as well as the economic theories used to describe and justify patent doctrine. The patentee's reward would be preserved from attack, yet circumscribed by the patentee's contribution to the advancement of the art. Improvements would be encouraged, protected, and rewarded. Finally, an obviousness standard of equivalence would make validity and infringement more symmetrical, a result both aesthetically pleasing and useful for understanding patent law, not as a patchwork of conflicting ideas, but as a consistent, rational, and unified body of law.

improvements."). If the relevant improvements are the obvious ones, the solution is found in the knowledge available to persons of ordinary skill.

[263] The costs of developing obvious variations may be lower than the costs of developing nonobvious variations; the former are easier to produce. But more rivals are attracted to the prospect of developing obvious alternatives – because of the lower costs to each rival, the larger pool of effective competitors, and the relative certainty of success – so, *in the aggregate*, the rent associated with the original invention may be as effectively, if not more effectively, dissipated.