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JUST WHO IS THE PERSON HAVING ORDINARY SKILL IN THE ART? PATENT LAW'S MYSTERIOUS PERSONAGE

Joseph P. Meara, Ph.D.

Abstract: Various patent validity and infringement questions are decided against the standard of the "person having ordinary skill in the art" (Phosita). For example, under 35 U.S.C. § 103(a), an invention must be nonobvious to one of ordinary skill in the art to be granted a patent. In this context, the Federal Circuit has set out six factors for measuring the level of skill of Phosita, yet the court has provided remarkably little guidance in their use and their relationship to nonobviousness. This situation has led to confusion and difficulties among courts trying to assess Phosita's skill. This Comment argues that the current factors must be abandoned or modified, and suggests new factors which more accurately reflect the underlying purpose of the Phosita standard.

Patent law's "person having ordinary skill in the art" (Phosita[1]) has been likened to the reasonable person of tort law.[2] Just as the fact finder must resolve a negligence claim against the standard of the reasonable person, so too must one assess various patent validity and infringement claims in comparison to the person having ordinary skill in the art.[3] Inventions that would have been obvious to one of ordinary skill in the art are unpatentable.[4] Applications that fail to teach one of ordinary skill in the art how to make or use the invention are invalid.[5] Patent claims, which set forth metes and bounds of the property right, are construed in light of what the person of ordinary skill would understand them to describe.[6] Thus, in litigation, the scope of patent protection depends greatly on the court's determination of the level of ordinary skill in the art for the particular field of invention.

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1. Cyril A. Soans first coined the Phosita moniker in *Some Absurd Presumptions in Patent Cases*, 10 IDEA 433, 438 (1966).

2. *See, e.g.*, Panduit Corp. v. Dennison Mfg. Co., 810 F.2d 1561, 1566 (Fed. Cir. 1987) (determining that, in the course of the nonobviousness assessment, "the decisionmaker confronts a ghost, i.e., 'a person having ordinary skill in the art,' not unlike the 'reasonable man' and other ghosts in the law").

3. See John O. Tresansky, *PHOSITA—The Ubiquitous and Enigmatic Person in Patent Law*, 73 J. PAT. & TRADEMARK OFF. SOC'Y 37, 37 (1991).

4. 35 U.S.C. § 103 (1994 & Supp. 1999).

5. *See id.* § 112, para. 1.

6. *See, e.g.*, Orthokinetics, Inc. v. Safety Travel Chairs, Inc., 806 F.2d 1565, 1576 (Fed. Cir. 1986) (holding that claims are invalid for indefiniteness under 35 U.S.C. § 112, para. 2, if one skilled in the art would not understand what is claimed when read in light of the specification).

Yet, this critical factual inquiry has received comparatively little attention from the Federal Circuit, the exclusive appellate court for patent disputes.[7] This Comment examines how the Federal Circuit and lower courts have defined and assessed the "ordinary level of skill in the art" in the context of nonobviousness, a fundamental patentability requirement and the origin of the Phosita standard. Part I gives an overview of the purpose of patent law and basic patentability requirements. Part II examines how the level of ordinary skill in the art affects nonobviousness determinations, and how the lower courts have used factors set forth by the Federal Circuit to conduct the skill inquiry. Part III argues that the current factors do not advance the nonobviousness inquiry and should be discarded or, in some cases, refined. Part IV proposes new factors for determining the level of ordinary skill in the art that are more consistent with the intent and purpose of the nonobviousness inquiry.

I. OVERVIEW OF THE PATENT SYSTEM

By allowing inventors the opportunity to profit from their inventions, the patent system spurs innovation, to the benefit of society. A patent will only be granted on an invention if the application meets minimum disclosure requirements and if the invention is useful, novel, and nonobvious.[8] These requirements ensure that publicly available knowledge is not removed from the public domain.

A. The Policy Behind the Patent System

The patent system exists to encourage innovation for the benefit of society.[9] The constitutional provision empowering Congress to create a patent system reflects this policy by placing general limits on which inventions may be protected and the scope of the protection.[10] The patent

7. The Federal Circuit, created in 1982, has exclusive appellate jurisdiction for all patent infringement and validity suits. Federal Courts Improvement Act of 1982, Pub. L. No. 97-164, 96 Stat. 25 (relevant provisions codified as amended in scattered sections of 28 U.S.C.); Rochelle Cooper Dreyfuss, *The Federal Circuit: A Case Study in Specialized Courts*, 64 N.Y.U. L. REV. 1, 3–4 (1989).

8. 35 U.S.C. §§ 101–03.

9. *See* Graham v. John Deere Co., 383 U.S. 1, 9 (1966).

10. Congress has power to "promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and

statutes implement the constitutional directive by balancing the need to provide incentive to inventors with the need to encourage competition through the dissemination and refinement of inventions.[11] Upon the grant of a patent, an inventor may exclude others from making, using, selling, or importing the inventor's patented invention for a limited time.[12] These rights give inventors the opportunity to recover research and development costs and realize profits.[13] In return, the inventor must meet minimum conditions of patentability and must sufficiently disclose the invention to permit others to make and use it after it enters the public domain.[14] In fact, the information disclosed by the patentee is often used to build upon or design around the invention long before expiration of the patent. Thus, market competition is encouraged despite the presence of patent monopolies.

B. Obtaining a Patent

To obtain a patent, inventors must submit an application describing their invention to the United States Patent and Trademark Office (PTO) for examination.[15] The application must (1) provide, in the specification, sufficient *written description* to assure those skilled in the art that the inventor truly possesses the invention;[16] (2) disclose sufficient detail to *enable* others skilled in the art to make and use the invention;[17] and (3) clearly set out the metes and bounds of the invention through one or more *claims*.[18] In addition to these disclosure requirements, the invention

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Discoveries." U.S. CONST. art. I, § 8, cl. 8; *see also* Bonito Boats, Inc. v. Thunder Craft Boats, Inc., 489 U.S. 141, 146 (1989).

11. *See Bonito Boats*, 489 U.S. at 146. For an in-depth discussion of the economics of patent law, see JOHN W. SCHLICHER, PATENT LAW: LEGAL AND ECONOMIC PRINCIPLES (1992).

12. *See* 35 U.S.C. § 271(a). Utility patents—the primary form of patent protection for functional products—have terms ending up to twenty years from filing of the application. 35 U.S.C. § 154(a)(2).

13. *See, e.g.*, John W. Schlicher, *Biotechnology and the Patent System; Patent Law and Procedures for Biotechnology, Health Care and Other Industries*, 4 U. BALT. INTELL. PROP. J. 121, 123–24 (1996) (stating that patent right provides an incentive to invent). *But see* Rebecca S. Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, 56 U. CHI. L. REV. 1017, 1024–28 (1989) (discussing situations in which the incentive may be unnecessary or counterproductive).

14. *Bonito Boats*, 489 U.S. at 150.

15. 35 U.S.C. §§ 111, 131.

16. *Id.* § 112, para. 1.

17. *Id.*

18. *See id.* § 112, para. 2.

must fulfill fundamental patentability conditions before a patent will be granted.[19]

During the examination process, if a PTO examiner finds invalidating prior art, the application will be rejected.[20] The applicants, through their attorney, may then argue and/or amend the application to convince the examiner that the application conforms to statutory requirements.[21] Once the application meets all the requirements, it is accepted[22] and a patent is issued with a presumption of validity.[23] A challenger in litigation must prove invalidity by clear and convincing evidence.[24]

C. *Conditions of Patentability*

Inventors may obtain a patent for "anything under the sun that is made by man"[25] if it is useful, novel, and nonobvious.[26] These patentability conditions prevent inventors from obtaining a monopoly on inventions already within the public domain.[27] An invention is useful if it provides some relatively low level of public benefit. For example, both a life-saving drug and a shirt with a puppet head built into one sleeve[28] meet the utility standard under the patent statute. However, inventions without any credible utility are unpatentable.[29]

An invention is novel if no other pre-existing invention is exactly like it; i.e., no other pre-existing invention has every claimed element in exactly the same arrangement.[30] For example, a light bulb with a molybdenum filament is novel over an otherwise identical light bulb with

19. *See infra* Part I.C.

20. *See* 37 C.F.R. § 1.104 (2002). "Prior art" is a term of art referring to any publicly available reference that predates and is pertinent to the claimed invention. *See infra* note 60 and accompanying text.

21. *See* 37 C.F.R. 1.111–.113.

22. *See id.* at § 1.104.

23. 35 U.S.C. § 282.

24. *See, e.g.*, Hybritech, Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1375 (Fed. Cir. 1986).

25. Diamond v. Chakrabarty, 447 U.S. 303 (1980) (citations omitted).

26. 35 U.S.C. §§ 101–03.

27. Bonito Boats, Inc. v. Thunder Craft Boats, Inc., 489 U.S. 141, 146 (1989).

28. *See, e.g.*, U.S. Patent No. 4,980,929 (issued Jan. 1, 1991) (issuing patent for long-sleeved garment with integrated animal design and puppet-like sleeve).

29. *See* Brenner v. Manson, 383 U.S. 519, 535 (1966) (holding that chemical process to produce compound of unknown utility is unpatentable).

30. The anticipating invention must be disclosed in a single prior art reference. *See* Lewmar Marine, Inc. v. Barient Inc., 827 F.2d 744, 747 (Fed. Cir. 1987).

a tungsten filament. Even trivial differences will impart novelty to an invention. An orange plastic trash bag would be novel if all previous such bags were black, brown, or green.[31] Yet, such a novel invention still might not be patentable if it does not meet the other patentability conditions.

Utility and novelty alone do not qualify an invention for patentability;[32] the invention must also be nonobvious to a "person having ordinary skill in the art."[33] In fact, it would be unconstitutional to issue a patent for subject matter that could be "readily deduced from publicly available material."[34] In other words, an invention may be novel if no previous invention contained each of its elements arranged in exactly the same way. Yet, if it is trivial to invent based on earlier work, the invention should be considered part of the public domain and may not be patented.[35] For example, the invention of purple sunscreen lotion, when all previous sunscreens were white, may be obvious if the sunscreen is otherwise identical in its properties. If the reason for the purple color is that the compound imparting it more effectively blocks the sun's ultraviolet rays, then the invention may not be obvious. Nonobviousness depends on what the ordinary level of skill is in the art of sunscreen formulations. Therefore, whether a patent is valid often depends on the court's characterization of Phosita.

II. NONOBVIOUSNESS AND THE ROLE OF THE "PERSON HAVING ORDINARY SKILL IN THE ART"

Determining the level of ordinary skill in the art is a widespread inquiry that one might expect to reflect the process of invention as it occurs in a variety of forms. The Federal Circuit has developed standards for defining the person having ordinary skill in the art for the purpose of determining nonobviousness. Although the Federal Circuit declared six factors for defining Phosita in *Environmental Designs, Ltd. v. Union Oil*

31. This example is similar to an actual case. *See In re* Dembiczak, 175 F.3d 994, 1001 (Fed. Cir. 1999) (reversing holding of Board of Patent Appeals and Interventions that a plastic trash bag that looks like a Halloween jack-o-lantern was unpatentable, not for lack of novelty, but for obviousness).

32. *Bonito Boats*, 489 U.S. at 149–50.

33. 35 U.S.C. § 103 (1994 & Supp. 1999).

34. *Bonito Boats*, 489 U.S. at 150.

35. *See id.*

Co.,[36] subsequent decisions reveal inconsistent application of these factors.

A. Development of Phosita in the Context of Nonobviousness

In an effort to end judicial confusion about the standard of patentable invention, Congress codified the nonobviousness requirement at 35 U.S.C. § 103 in the 1952 Patent Act.[37] Under this statute, a patent will not be granted unless an invention is nonobvious to a person having ordinary skill in the art.[38] The landmark U.S. Supreme Court decision, *Graham v. John Deere Co.*,[39] spelled out the factual inquiries underlying the nonobviousness determination, including the assessment of the skill of Phosita. Subsequently, the Federal Circuit has emphasized the importance of the Phosita determination and has set forth a series of factors for measuring the skill of Phosita in *Environmental Designs*.[40]

1. The Basis of the Nonobviousness Inquiry

As befits the most litigated aspect of patent law,[41] nonobviousness has eluded precise definition since it arose as a judicial construction more than 150 years ago in *Hotchkiss v. Greenwood*.[42] In that case, the U.S. Supreme Court defined the standard of patentable "invention" as requiring more ingenuity than was possessed by the "ordinary mechanic acquainted with the business."[43] Subsequently, a variety of standards for "invention" evolved through a tangled history of court decisions at all levels until Congress codified what it hoped would be a more

36. 713 F.2d 693 (Fed. Cir. 1983).

37. Patent Act of 1952, Pub. L. No. 82-593, § 103, 66 Stat. 798 (1952).

38. 35 U.S.C. § 103(a).

39. 383 U.S. 1 (1966).

40. *Envtl. Designs*, 713 F.2d at 696.

41. Between 1989 and 1996, litigants asserted the invalidity of patents for obviousness more often than any other theory, though they succeeded only 36% of the time. Nonetheless, 42% of patents found invalid in litigation failed for obviousness, a higher rate than for any other reason. *See* John R. Allison & Mark A. Lemley, *Empirical Evidence on the Validity of Litigated Patents*, 26 AIPLA Q.J. 185, 208 (1998).

42. 52 U.S. (11 How.) 248 (1851).

43. *Id.* at 266 (finding that replacing porcelain door knobs with those made of wood or glass not patentable).

straightforward test of patentability in section 103 of the 1952 Patent Act.[44]

Section 103 of the Patent Act does not permit the grant of a patent for a novel invention "if 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 the subject matter pertains."[45] The statute codified the ordinary mechanic of *Hotchkiss* as "the person having ordinary skill in the art."[46] Therefore the statutory language requires a decision-maker to determine in which art the invention lies, the level of skill possessed by Phosita in that art, and whether the invention is obvious to Phosita.

Section 103 further provides that an "[i]nvention shall not be negatived by the manner in which the invention was made."[47] This awkward language was intended to overrule the court-created "flash of genius" test.[48] The lower courts had interpreted this test as setting a very high standard for "invention"; only inventions made by inventors in a "flash of creative genius" were patentable.[49] The federal statute's Reviser's Note explains that "it is immaterial whether [an invention] resulted from long toil and experimentation or from a flash of genius."[50] Nonetheless, even after enactment of section 103, the hoped-for stability in the law of patentability proved elusive.[51]

Confusion over the standard for nonobviousness continued in the lower courts,[52] leading to the landmark case of *Graham v. John Deere Co.*[53] in 1966. In *Graham*, the Supreme Court interpreted section 103 as

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44. Patent Act of 1952, Pub. L. No. 82-593, § 103, 66 Stat. 798 (1952); *see also* 1 IRVING KAYTON, PATENT PRACTICE 5.7–.9 (6th ed., Release 3.0 1998) (discussing the judicial history preceding the enactment of the 1952 Patent Act).

45. 35 U.S.C. § 103(a) (1994 & Supp. 1999).

46. *Id.*; *see also* Graham v. John Deere Co., 383 U.S. 1, 3–4 (1966).

47. 35 U.S.C. § 103(c).

48. *Graham*, 383 U.S. at 15 n.7. This test originated in *Cuno Corp. v. Automatic Devices Corp.*, 314 U.S. 84, 91 (1941).

49. *Graham*, 383 U.S. at 15 n.7.

50. *Id.* at 16 n.8 (quoting the Reviser's Note).

51. *See id.* at 16.

52. For an overview of the history of nonobviousness see, for example, KAYTON, *supra* note 44, at 5.12–.17.

53. 383 U.S. 1 (1966). This case was one of three nonobviousness cases, known as "The Trilogy," which the Supreme Court decided on the same day. *See* James B. Gambrell & John H. Dodge II, *Ordinary Skill in the Art—An Enemy of the Inventor or a Friend of the People*, *in* NONOBVIOUSNESS—THE ULTIMATE CONDITION OF PATENTABILITY 5:301, 5:309 (J.

requiring three factual inquiries to reach a conclusion on the issue of obviousness.[54] The fact-finder must (1) determine the scope and content of the prior art; (2) ascertain the differences between the invention and the prior art; and (3) determine the ordinary level of skill in the art at the time the invention was made.[55] The Court also noted that secondary considerations, i.e., objective evidence such as commercial success, long-felt but unresolved need, or skepticism of those in the art, bear on the ultimate conclusion of nonobviousness.[56] The Court urged strict observance of these requirements for judging nonobviousness, but did not further address the third prong of the test, the Phosita inquiry.[57] Consequently, it has fallen to the Federal Circuit to develop the elements of the nonobviousness inquiry and explain the Phosita standard more fully.

In its most recent comprehensive statement on the law of nonobviousness, the Federal Circuit in *Ruiz v. A.B. Chance Co.*[58]

Witherspoon ed., 1980). At issue was the obviousness of the mode of attachment of a plow shank to a plow frame. *Graham*, 383 U.S. at 4. The second case, involving Cook Chemical, was combined with and decided in the *Graham* opinion. It concerned the obviousness of a new type of sprayer head for bottles packaging liquid products such as insecticides. *Id.* at 4–5. The Court decided the third case separately. *See* United States v. Adams, 383 U.S. 39 (1966).

54. *See Graham*, 383 U.S. at 17–18. The *Graham* Court did not clearly state whether obviousness was a legal or factual conclusion. *See id.* at 17 ("While the ultimate question of patent validity is one of law, . . . the § 103 condition, which is but one of three conditions, each of which must be satisfied, lends itself to several basic factual inquiries."). The Federal Circuit has treated § 103 as a question of law. Lawrence M. Sung, *Echoes of Scientific Truth in the Halls of Justice: The Standards of Review Applied by the United States Court of Appeals for the Federal Circuit in Patent-Related Matters*, 48 AM. U. L. REV. 1233, 1295–96 n.395 (1999).

55. *Graham*, 383 U.S. at 17–18.

56. *Id.* The Federal Circuit has subsequently stressed the importance of secondary considerations to the nonobviousness analysis, calling them "often . . . the most probative and cogent evidence in the record." Stratoflex, Inc., v. Aeroquip Corp., 713 F.2d 1530, 1538 (Fed. Cir. 1983). It has even referred to secondary considerations as the fourth inquiry of *Graham*. Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc., 796 F.2d 443, 447 (Fed. Cir. 1986). However, some of the factors, such as commercial success, have been criticized as nonprobative of obviousness. *See generally* Robert P. Merges, *Commercial Success and Patent Standards: Economic Perspectives on Innovation*, 76 CAL. L. REV. 805 (1988) (arguing that the use of commercial success to assess the non-obviousness of an invention rewards non-technical achievement such as superior marketing rather than true inventive advances). Nonetheless, factors such as long-felt but unsolved need in the art for a solution to a problem and the prior failure of others to make the invention have been accorded more value. *See id.* at 862–66.

57. *Graham*, 383 U.S. at 17–18. Although the Supreme Court later strayed from this analysis in subsequent cases, the Federal Circuit continues to rely on the *Graham* analysis. *See* KAYTON, *supra* note 44, at 5.12–.17; *see also* Ag Pro, Inc. v. Sakraida, 425 U.S. 273, 282–83 (1976); Anderson's-Black Rock, Inc. v. Pavement Salvage Co., 396 U.S. 57, 59–61 (1969). The Supreme Court has not substantively addressed nonobviousness since these opinions.

58. 234 F.3d 654 (Fed. Cir. 2000).

explained the *Graham* analysis and reiterated the necessity of *Graham* findings as a precursor to invalidating a patent for obviousness.[59] As to the first *Graham* factor, the *Ruiz* court held that the scope and content of the prior art include that which is "reasonably pertinent to the particular problem with which the invention was involved."[60] In a nonobviousness analysis, no single prior art reference contains all the elements of the invention because of the differences between the claimed invention and the prior art.[61] The party asserting invalidity of a patent for nonobviousness must therefore rely on the modification of a single reference or the combination of two or more references to arrive at the claimed subject matter.[62]

To guard against a finding of obviousness based on a hindsight reconstruction of the invention, the Federal Circuit requires a factual finding that a "suggestion . . . or motivation in the prior art or elsewhere . . . would have led one of ordinary skill in the art to [modify or] combine the references."[63] Motivation may come from the prior art itself, from knowledge of one of ordinary skill in the art, or from the nature of the problem to be solved.[64] Hence, the suggestion/motivation test ensures that on the question of what constitutes pertinent art, the decision-maker will not substitute her own judgment for that of a Phosita at the time the invention was made.

In relation to the second prong of *Graham*, the *Ruiz* court held that the fact-finder must not simply compare differences between the prior art and the invention on an element-by-element basis. Instead, the fact-finder must judge the nonobviousness of the invention as a whole.[65]

Finally, the *Ruiz* court emphasized that the determination of the level of ordinary skill in the art is an integral part of the *Graham* analysis and

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59. *Id.* at 663.

60. *Id.* at 664 (quoting *Stratoflex*, 713 F.2d at 1535). Pertinent art includes those references that fall within the technological field of the claimed invention and any analogous technology. 2 PETER D. ROSENBERG, PATENT LAW FUNDAMENTALS § 9.02[2][a][i] (2000). Only those references that became publicly available prior to the date of invention may be considered. *Id.* Prior art constitutes "analogous art" "when a person of ordinary skill would reasonably have consulted those references and applied their teachings when attempting to solve the same problem as the inventor." *Id.* at § 9.03.

61. *See Ruiz*, 234 F.3d at 664–65.

62. *Id.* PATENT AND TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE § 2143.01 (7th ed. 1998) [hereinafter PTO MANUAL].

63. *Ruiz*, 234 F.3d at 664.

64. *See id.* at 665.

65. *Id.* (quoting Hybritech, Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1383 (Fed. Cir. 1986)).

is critical to a proper assessment of obviousness.[66] Without such a determination, there is no standard by which to judge the obviousness or nonobviousness of an invention.[67] Thus, although it may sometimes be avoided, many lower courts attempt some finding on the level of skill in the art.[68] While the *Ruiz* court listed factors by which a decision-maker might determine the level of ordinary skill in the art, it did not review key attributes of the Phosita construct.[69] The remainder of this section explores the guidance the Federal Circuit has provided for measuring the skill level of Phosita.

2. *Identifying Phosita and Measuring the Level of Ordinary Skill in the Art: The Factors of* Environmental Designs, Ltd. v. Union Oil Co.

The person having ordinary skill in the art is a hypothetical person who is presumed to know all the relevant art within the field of invention and any analogous technical fields.[70] She is not the judge, a layman, one skilled in remote arts, or a genius in the art at hand.[71] Phosita is not the inventor, but rather an uncreative person that thinks along conventional lines, never seeking to innovate.[72] In contrast, inventors possess some indefinable quality setting them apart from the person of ordinary skill.[73] Hence, the test does not ask what would have been subjectively obvious to the inventor.[74] Instead the court must determine whether the invention would have been objectively obvious to the hypothetical person having ordinary skill in the art at the time the invention was made.[75] Without evaluation from the perspective of one of ordinary skill in the art, most inventions would be deemed obvious because the decision-maker could

66. *Id.* at 666.

67. *See id.*

68. *See infra* Part II.B. The *Ruiz* court noted that failure to make an explicit factual finding on the level of ordinary skill is not always reversible error. *Ruiz*, 234 F.3d at 667 (citing Kloster Speedsteel AB v. Crucible Inc., 793 F.2d 1565, 1574 (Fed. Cir. 1986)). When an invention is obvious to one of the lowest skill level or nonobvious to one of the highest skill level, a specific finding on Phosita is unnecessary. *Kloster*, 793 F.2d at 1573–74.

69. *Ruiz*, 234 F.3d at 666–67. The factors are discussed *infra* notes 76–95 and accompanying text.

70. *See* Standard Oil Co. v. Am. Cyanamid Co., 774 F.2d 448, 454 (Fed. Cir. 1985).

71. *See* Envtl. Designs, Ltd. v. Union Oil Co., 713 F.2d 693, 697 (Fed. Cir. 1983).

72. *Standard Oil*, 774 F.2d at 454.

73. *Id.*

74. Ryko Mfg. Co. v. Nu-Star, Inc., 950 F.2d 714, 718 (Fed. Cir. 1991).

75. *Id.*

merely piece together elements from the prior art using the invention as a blueprint.[76] Deciding whether a Phosita would choose the exact prior art references from among the thousands or even tens of thousands in a field to create the claimed invention is the crux of the nonobviousness inquiry.[77]

Early in its existence the Federal Circuit discussed the importance of determining the level of skill in the art and set out factors for making this determination. In 1983, the court in *Orthopedic Equipment Co. v. United States*[78] (*Orthopedic I*) drew on a pre-Federal Circuit decision, *Jacobson Brothers, Inc. v. United States*,[79] which enumerated five factors relevant to the determination of the level of skill of the ordinary person.[80] Subsequently, in *Orthopedic Equipment Co. v. All Orthopedic Appliances, Inc.*[81] (*Orthopedic II*), the Federal Circuit introduced the inventor's level of education as a factor to consider, though the court noted that this factor was not conclusive.[82] Later in 1983, the Federal Circuit consolidated the factors of *Orthopedic I* and *II* to create the current test.[83]

In *Environmental Designs, Ltd. v. Union Oil Co.*,[84] the Federal Circuit held that the following factors were relevant to determining level of skill in the art: (1) educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which inventions are made; (5) sophistication of the technology; and (6) educational level of active workers in the field.[85] While the lower courts, struggling to follow section 103, have often quoted these factors,[86] the Federal Circuit has had little to say about how

76. *See id.*

77. *See* Gambrell & Dodge, *supra* note 53, at 5:326.

78. 702 F.2d 1005 (Fed. Cir. 1983).

79. 512 F.2d 1065 (Ct. Cl. 1975) (adopting opinion originally published in 184 U.S.P.Q. (BNA) 181, 185).

80. *See Orthopedic I*, 702 F.2d at 1011 (citing *Jacobson Bros.*, 512 F.2d at 1011).

81. 707 F.2d 1376 (Fed. Cir. 1983).

82. *Id.* at 1382.

83. *See* Envtl. Designs, Ltd. v. Union Oil Co., 713 F.2d 693, 696 (1983).

84. 713 F.2d 693 (Fed. Cir. 1983).

85. *Id.* at 696. The court presented the factors as part of its review of the district court's nonobviousness determination. Because the parties agreed that their experts at trial were representative of Phosita, the Federal Circuit did not rule on this point. *Id.* at 697. The court affirmed the lower court's finding that the defendant's patent for removing sulfur from gas streams was nonobvious over the prior art. *Id.*

86. According to an online search by the author on November 30, 2001, at least 80 lower court decisions have cited five or more of the factors. *See, e.g.*, N. Am. Oil Co. v. Star Brite Distrib., Inc.,

to use them. The only guidance the *Environmental Designs* court provided was that not all the factors may be present in every case and any factor might predominate in a Phosita determination.[87] With but two exceptions, neither the precedent the court relied on for the factors, nor subsequent Federal Circuit opinions, have addressed how to use these factors in measuring the skill level of Phosita.[88]

B. Application of the Environmental Designs *Factors*

In five subsequent nonobviousness opinions citing the factors of *Environmental Designs*, the Federal Circuit has provided little guidance for the use of the factors.[89] The purpose of considering the inventor's education level is unclear and this factor has led to confusion in the lower courts.[90] While the Federal Circuit has not further addressed the educational level of active workers in the field, the lower courts have occasionally read this factor to include experience and knowledge.[91] Similarly, the Federal Circuit has been silent with regard to the rapidity of innovation and the sophistication of technology factors. In just one decision, In re *GPAC Inc.*,[92] has the Federal Circuit substantively discussed the role of the factors, specifically prior art problems and solutions, in a nonobviousness inquiry.[93] The following sections outline the Federal Circuit's and other courts' treatment of the *Environmental Designs* factors.

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148 F. Supp. 2d 1351, 1361 (N.D. Ga. 2001); Imperial Chem. Indus., P.L.C. v. Danbury Pharm., Inc. 777 F. Supp. 330, 371 (D. Del. 1991); Boots Laboratories, Inc. v. Burroughs Wellcome, Co., 223 USPQ 840, 848 (E.D. Va. 1984).

87. *Envtl. Designs*, 713 F.2d at 696–97.

88. *See infra* Part II.B.4.

89. *See* Ruiz v. A.B. Chance Co., 234 F.3d 654, 666–67 (Fed. Cir. 2000); *In re* GPAC Inc., 57 F.3d 1573, 1579 (Fed. Cir. 1995); Ryko Mfg. Co. v. Nu-Star, Inc., 950 F.2d 714, 718 (Fed. Cir. 1991); Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc, 807 F.2d 955, 962–63 (Fed. Cir. 1986); Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc., 796 F.2d 443, 449–50 (Fed. Cir. 1986).

90. *See infra* Part II.B.1.

91. *See, e.g.*, Bose Corp. v. JBL, Inc., 112 F. Supp. 2d 138, 155 (D. Mass. 2000) (finding that one skilled in the art of loudspeaker design has two to three years of such experience, and is familiar with aerodynamics, fluid flow mechanics, and acoustics).

92. 57 F.3d 1573 (Fed. Cir. 1995).

93. *Id.* at 1579.

1. Educational Level of the Inventor

Without providing a clear rationale for doing so, the Federal Circuit has considered the educational level of the inventor in Phosita determinations.[94] On the one hand, the court has made clear that Phosita is not the inventor.[95] The subjective condition of the mind of the inventor[96] and the actual skill of the inventor are irrelevant to the determination of nonobviousness.[97] On the other hand, in the progeny of *Environmental Designs*, the Federal Circuit has often included the educational level of the inventor as a factor to consider in assessing Phosita.[98] The court has on occasion de-emphasized the inventor's education factor by not including it as part of its list of factors.[99] Yet, as in *Orthopedic II*, the court has also noted that the inventor's educational level is not determinative of nonobviousness, but in doing so, implied that the factor is still relevant to the Phosita inquiry.[100] Thus, tension exists between the Federal Circuit's insistence that an inventor's level of education may be a component in the determination of the ordinary level of skill in the art and its prohibition on considering what the inventor would have done if faced with the same prior art.[101]

Lower courts and the PTO continue to consider the inventor's level of education as promulgated by *Environmental Designs* and its precursors. For example, the PTO includes educational level of the inventor and the other five factors in the Manual of Patent Examining Procedure (MPEP), the reference that PTO personnel employ when examining patents.[102]

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94. Use of this factor implies that the inventor is representative of Phosita and that educational level is relevant to skill level. *See* KAYTON, *supra* note 44, at 5.22.

95. *See* Kimberly-Clark Corp. v. Johnson & Johnson, 745 F.2d 1437, 1454 (Fed. Cir. 1984).

96. Ryko Mfg. Co. v. Nu-Star, Inc., 950 F.2d 714, 718 (Fed. Cir. 1991) (citing Kloster Speedsteel AB v. Crucible Inc., 793 F.2d 1565, 1574 (Fed. Cir. 1986)).

97. *See, e.g.*, Stewart-Warner Corp. v. City of Pontiac, 767 F.2d 1563, 1570 (Fed. Cir. 1985) ("[S]ection 103 is not concerned with the actual skill of the inventors—whose skill may be extraordinary—but rather with the level of ordinary skill in the art.").

98. *See, e.g.*, *Ryko*, 950 F.2d at 718; Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc., 796 F.2d 443, 449 (Fed. Cir. 1986).

99. *See, e.g.*, Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc., 807 F.2d 955, 962 (Fed. Cir. 1986).

100. *Id.* at 961. Subsequently, in *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 666–67 (Fed. Cir. 2000), the court cited the list of factors from *Custom-Accessories* but did not mention the inventor's level of education at all.

101. Standard Oil Co. v. Am. Cyanamid Co., 774 F.2d 448, 454 (Fed. Cir. 1985) ("[O]ne should not go about determining obviousness under § 103 by inquiring into what *patentees* (i.e., inventors) would have known or would likely have done, faced with the revelations of references.").

102. *See* PTO MANUAL, *supra* note 62, § 2141.03.

More than half of the district court cases that explicitly refer to the Phosita factors consider the inventor's education factor.[103] In some instances, the opinions go further and liken the inventor to Phosita. For example, the court in *Imperial Chemical Industries, PLC v. Danbury Pharmacal*[104] (*ICI*) noted that the inventor's education and experience matched that of Phosita.[105] The court went on to find the patent on a successful drug for the treatment of hypertension invalid for obviousness.[106] The intensely fact-dependent nature of the nonobviousness inquiry makes it difficult to determine whether a decision such as this one is incorrect.[107] Nonetheless, cases such as *ICI* raise the possibility that the Federal Circuit's own factors may lead a judge to equate Phosita with the inventor, a fallacy the Federal Circuit has continually warned against.[108] The fact that jury instructions typically include the inventor's education factor also increases the potential for confusion.[109] Therefore, consideration of the inventor's education level has proven to be problematic.

2. *Educational Level of Active Workers in the Field*

While the Federal Circuit has not commented on the use of the educational level of active workers in the field, district courts often attribute a particular level of education to Phosita. Educational levels may span the range from nearly nonexistent, such as in the art of fly

103. An online search by the author of district court cases from March 1983, the date of *Orthopedic I*, through Nov. 2001 reveals 38 nonobviousness cases citing the inventor's education factor out of a total of 80 cases citing at least 5 of the factors. (This list does not include jury trials but only bench trials and summary judgment rulings.) *See, e.g.*, Graham v. Gun-Munro, No. C-99-04064 CRB, 2001 U.S. Dist. LEXIS 7110, *17 (N.D. Cal. May 22, 2001); Sunrise Med. HHG, Inc. v. Airsep Corp., 95 F. Supp. 2d 348, 453 (W.D. Penn. 2000); Biacore, AB v. Thermo Bioanalysis Corp., 79 F. Supp. 2d 422, 464 (D. Del. 1999).

104. 777 F. Supp. 330 (D. Del. 1991).

105. *Id.* at 352.

106. *See id.* at 373.

107. Many times courts have trouble deciding the correct outcome for obviousness inquiries. *See, e.g.*, Litton Sys., Inc. v. Honeywell Inc., 87 F.3d 1559, 1570 (Fed. Cir. 1996) (noting that the obviousness inquiry is highly fact-specific and reversing the lower court's grant of judgment as a matter of law that had overturned a jury's finding of nonobviousness).

108. *See supra* notes 94–96 and accompanying text.

109. *See, e.g.*, DUANE BURTON, JURY INSTRUCTIONS IN INTELLECTUAL PROPERTY CASES § 20:43:57 (1991).

wraps for the legs of horses,[110] to highly advanced, like those involved in drug discovery.[111] Courts have often specified a range of disciplines in which the Phosita may hold an educational degree. For example, in *Bose Corp. v. JBL, Inc.*,[112] the court found that a Phosita of loudspeaker design held a "bachelor of science degree in either electrical engineering, physics, mechanical engineering, or possibly acoustics."[113] Some courts have also made findings on the length of experience and the knowledge of sub-disciplines in which Phosita specializes.[114] The *Bose* court, for example, found that Phosita was "familiar with aerodynamics, fluid flow mechanics, and acoustics, and would have worked as a loudspeaker designer for two to three years."[115] These types of findings show that the district courts have routinely gone beyond a bare statement of the education level of active workers in the field to consider experience and knowledge in characterizing the skill of Phosita.

3. *Rapidity of Innovation and Sophistication of the Technology*

The Federal Circuit has not addressed the use of the rapidity of innovation factor, and the lower courts have only rarely confronted the issue.[116] In *Studiengesellschaft Kohle mbH v. Dart Industries, Inc.*,[117] the accused infringer argued that the invention, a method of making polymers, was obvious because of rapid progress by a third party toward the same invention.[118] The court rejected this characterization, in part because it rejected the implied assumption that the inventor, later a Nobel laureate, and the third party, DuPont, were representative of ordinary skill in the art of polymer chemistry.[119] Similarly, the trial court in

110. *See* Graham v. Gun-Munro, No. C-99-04064 CRB, 2001 U.S. Dist. LEXIS 7110, *19 (N.D. Cal. May 22, 2001) (finding Phosita to be a person with some formal education but no special skills or training in the relevant art).

111. *See* Imperial Chem. Indus., PLC v. Danbury Pharmacal, Inc., 777 F. Supp. 330, 371 (D. Del. 1991) (finding Phosita to be a Ph.D. organic chemist).

112. 112 F. Supp. 2d 138 (D. Mass. 2000).

113. *Id.* at 155.

114. *See, e.g.*, Sunrise Med. HHG, Inc. v. AirSep Corp., 95 F. Supp. 2d 348, 401–02 (W.D. Pa. 2000).

115. *Bose*, 112 F. Supp. 2d at 155.

116. An online search by the author of Federal Circuit precedent through November of 2001 did not reveal any nonobviousness cases containing "rapidity of innovation" or related terms other than those discussed in this article. *See infra* note 126.

117. 549 F. Supp. 716 (D. Del. 1982).

118. *Id.* at 727.

119. *See id.* at 732, 735.

Northern Telecom v. Datapoint[120] found unpersuasive the argument that the level of skill in computer science was high because of rapid technical evolution and a high level of sophistication in the technology.[121] Instead, the court relied primarily on the education of active workers in the field and their experience to ascertain the skill level of Phosita.[122] Thus, these cases shed little light on the use of the rapidity factor, and most lower courts that have explicitly cited the *Environmental Designs* factors ignore the rapidity factor.

Similarly, others have not found the rapidity factor to be useful. The American Intellectual Property Law Association (AIPLA), for example, has not included the rapidity of innovation factor in its model jury instructions.[123] In addition, commentators disagree as to the inference to be drawn from the rapidity of innovation factor.[124] For instance, in the context of a discussion of nonobviousness and biotechnology, one commentator noted that a fast-moving technology will not necessarily continue to progress at the same rate if patents were unavailable.[125] Therefore, both courts and commentators have recognized the difficulty in applying this factor.

In addition, the five nonobviousness decisions citing *Environmental Designs* or its progeny have not directly explained what effect the sophistication of the technology should have on the determination of Phosita.[126] In its discussion of prior art problems and solutions in In re *GPAC Inc.*,[127] the Federal Circuit implied that because it found the

120. 9 U.S.P.Q.2d 1577 (N.D. Tex. 1988).

121. *Id.* at 1625.

122. *Id.*

123. AMERICAN INTELLECTUAL PROPERTY LAW ASSOCIATION, GUIDE TO JURY INSTRUCTIONS IN PATENT CASES 25–29 (1990).

124. *Compare* Judith A. Szepesi, *Maximizing Protection for Computer Software*, 12 SANTA CLARA COMPUTER & HIGH TECH. L.J. 173, 179 (1996) (assuming that the rapid advances in computer software indicate a high level of skill by programmers) *with* Schlicher, *supra* note 13, at 131.

125. Schlicher, *supra* note 13, at 131.

126. *See* Ruiz v. A.B. Chance Co., 234 F.3d 654, 666–67 (Fed. Cir. 2000); *In re* GPAC Inc., 57 F.3d 1573, 1579 (Fed. Cir. 1995); Ryko Mfg. Co. v. Nu-Star, Inc., 950 F.2d 714, 718 (Fed. Cir. 1991); Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc, 807 F.2d 955, 962–63 (Fed. Cir. 1986); Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc., 796 F.2d 443, 449–50 (Fed. Cir. 1986); *see also* U.S. Surgical Corp. v. Ethicon, Inc., 103 F.3d 1554, 1564 (Fed. Cir. 1997) (citing a similar list of factors from jury instructions on nonobviousness during a review of the validity of the instructions).

127 57 F.3d 1573 (Fed. Cir. 1995).

technology somewhat sophisticated, the skill of Phosita was high.[128] However, in a related inquiry, the Federal Circuit has downplayed the significance of technological complexity in its motivation/suggestion test for nonobviousness.[129] For example, in In re *Dembiczak*,[130] the Federal Circuit noted that in the case of "less technologically complex inventions" it was especially important to make a factual finding of some motivation or teaching to combine prior art references before reaching a conclusion of obviousness.[131] In the context of a complex art, such as satellite communications, the court in In re *Rouffet*[132] again ignored the sophistication of the technology and focused on the motivation/suggestion test.[133] Although the Phosita was found to be highly skilled, the court affirmed that motivation cannot come solely from a high level of skill in the art.[134] While commentary predating the Federal Circuit noted a tendency in the courts to equate technological complexity with nonobviousness and simplicity with obviousness,[135] the Federal Circuit has rejected such a straightforward connection. Therefore, the proper application of the sophistication of technology factor is unclear.

4. Prior Art Problems and Solutions

Jacobson Brothers, Inc. v. United States[136] illustrates the use of the prior art factors in a level of ordinary skill inquiry.[137] In *Jacobson*, the licensee of a patent for an underwater salvage device employing closed-circuit TV sued the U.S. Navy for infringing the patent in its use of three deep-water torpedo recovery rigs.[138] Among its defenses, the Navy

128. *See id.* at 1579–80; *see also supra* Part II.B.2.

129. The motivation/suggestion test is discussed *supra* Part II.A.1.

130. 175 F.3d 994 (Fed. Cir. 1999).

131. *See id.* at 999–1000. The patent application at issue in *Dembiczak* concerned a trash bag designed to look like a pumpkin when full. The court reversed the Examiner's rejection for obviousness which the Board of Patent Appeals and Interferences had upheld. *Id.* at 1000.

132. 149 F.3d 1350 (Fed. Cir. 1998).

133. *See id.* at 1355–59.

134. *Id.* at 1356–57, 1359. As noted above, motivation to modify or combine prior art references can come from knowledge of one of ordinary skill in the art. *See supra* Part II.A.1.

135. Gambrell & Dodge, *supra* note 53, at 5:322–24.

136. 512 F.2d 1065 (Ct. Cl. 1975).

137. *See generally id.* at 1065 (adopting opinion originally published in 184 U.S.P.Q. (BNA) 181 (Ct. Cl. 1974)).

138. *See id.* at 1066–67.

asserted that Jacobson's patent was invalid for obviousness.[139] The court agreed that the Navy devices would infringe the licensee's patent if the patent were valid.[140] The patented and infringing devices each consisted of an underwater television camera and lights mounted on a frame with a grasping claw.[141] The rig was maneuvered on the ocean floor by means of a system of cables, pulleys, and winches.[142] This maneuvering system was critical for maintaining the stability of the rig in deep water operations.[143] The point of dispute was whether it was obvious to combine an underwater salvage device equipped with a TV camera and lights with a maneuvering system comprised of cables, pulleys, and winches.[144] The Court of Claims, adopting the trial court's opinion, found the patent invalid for obviousness.[145]

Because it had no other evidence, the Court of Claims evaluated the level of skill by considering the prior art references containing the main elements of the invention—the salvage rig with underwater TV and the maneuvering system.[146] The court approached this task by comparing the prior art problem to the problem solved by the invention.[147] It found that each problem concerned the maneuvering of a device in the presence of underwater currents and tides.[148] The court compared the prior art solution to the patented solution and found them to employ essentially identical systems of cables, pulleys, and winches.[149] Hence, the court reasoned inductively from the prior art problems/solutions, deciding that the logical gap was small between the invention and prior art.[150] Therefore, the invention was obvious to Phosita.[151]

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139. *Id.* at 1068.

140. *See id.*

141. *See id.* at 1067–68.

142. *Id.* at 1067.

143. *Id.* at 1069.

144. *Id.* at 1068–69.

145. *Id.* at 1073.

146. *Id.* at 1071.

147. *Id.*

148. In the absence of evidence to the contrary, the court assumed that a frame-mounted TV camera did not present any maneuvering or stability problems different from those of a diving bell. *Id.*

149. *Id.* at 1071–72.

150. *Id.*

151. *Id.* at 1073.

Since *Jacobson*, only one Federal Circuit case, In re *GPAC*, has addressed the use of the prior art factors in a nonobviousness analysis.[152] In that case, the applicant appealed a final rejection by the Board of Patent Appeals and Interferences (BPAI) for obviousness in a re-examination[153] of a patent for an asbestos removal containment system.[154] BPAI had not made a "specific finding" on the ordinary skill in the art, but instead cited the factors of *Environmental Designs* and relied on the level of skill displayed by the prior art.[155] The applicant argued that the board had ignored its expert evidence of a low skill level in the field, apparently based on education level of active workers.[156]

The Federal Circuit upheld the Board's finding of obviousness,[157] but did not follow the sort of analysis the Court of Claims made in *Jacobson*. Instead, the Federal Circuit found that one of the prior art references showed the prior art problems and potential solutions to be "somewhat sophisticated" because asbestos is a hazardous material and is therefore difficult to work with.[158] The court also commented that because asbestos removal was a highly regulated industry, a high level of skill was required.[159] For these reasons, the court found no clear error in the Board's determination, despite contradictory evidence of a low level of skill proffered by the appellant.[160] Therefore, the Federal Circuit upheld BPAI's finding of a high level of skill in the art and a conclusion of obviousness, based in part on a subjective characterization of the prior art problems and solutions rather than on what those problems and solutions taught one of ordinary skill in the art.[161]

Courts have proven to be uneven in their application of the *Environmental Designs* factors. While some factors such as the level of

152. *In re* GPAC Inc., 57 F.3d 1573, 1579 (Fed. Cir. 1995).

153. *Id.* at 1575. A reexamination occurs when the PTO examines an issued patent again in light of new prior art or new argument by the patentee or a third party. *See* 35 U.S.C. §§ 301–02 (1994 & Supp. 1999).

154. *See GPAC*, 57 F.3d at 1576; *see also Ex parte* GPAC Inc., 29 U.S.P.Q. 2d 1401, 1401 (B.P.A.I. 1993).

155. *GPAC*, 57 F.3d at 1579; Ex parte *GPAC*, 29 U.S.P.Q. 2d at 1432 (citing the *Environmental Designs* factors as set forth in *Custom Accessories, Inc. v. Jeffrey-Allan Industries, Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986)).

156. *GPAC*, 57 F.3d at 1579; Ex parte *GPAC*, 29 U.S.P.Q 2d at 1432.

157. *GPAC*, 57 F.3d at 1584.

158. *Id.* at 1579.

159. *Id.*

160. *Id.* at 1579–80.

161. *See id.*

education of active workers in the field have been broadly interpreted, other factors such as the rapidity of innovation have been virtually ignored. Still others, such as the inventor's education level and sophistication of the technology, seem to confuse lower courts. Such problems in application suggest that the current test for Phosita should be reevaluated and adjusted to better reflect the intent behind the Phosita inquiry.

III. CURRENT FEDERAL CIRCUIT METHODOLOGY FOR DETERMINING THE LEVEL OF ORDINARY SKILL IN THE ART DOES NOT ADVANCE THE NONOBVIOUSNESS INQUIRY

A number of the current Federal Circuit factors for determining the level of ordinary skill should be abandoned or modified because they do not advance the nonobviousness inquiry. Consideration of the educational level of the inventor contravenes the patent statute and the Federal Circuit's own precedent. This factor thus frustrates the purpose of the skill inquiry and confuses lower courts. The educational level of workers active in the field is also insufficient to determine the technical skill level of Phosita. Finally, the rapidity of innovation and sophistication of technology factors are indeterminate and therefore not probative of the level of ordinary skill question.

A. Consideration of the Inventor's Level of Education Contravenes Patent Law and Confuses Lower Courts

The inventor's education factor contradicts statute, precedent, and the purpose of the Phosita inquiry.[162] The plain language of the first sentence of section 103 requires obviousness to be assessed from the perspective of the hypothetical "person having ordinary skill in the art."[163] It does not mention or otherwise invoke analysis of the inventor. The Supreme Court's opinion in *Graham v. John Deere Co.* is consistent with this straightforward interpretation.[164] The statute also declares that, "[p]atentability shall not be negatived by the manner in which the

162. *See* KAYTON, *supra* note 44, at 5.22.

163. 35 U.S.C. § 103(a) (1994 & Supp. 1999).

164. *See* Graham v. John Deere Co., 383 U.S. 1, 17 (1966) (holding that under section 103 the ordinary skill in the art must be resolved and not imposing any further requirement related to the invention).

invention was made."[165] This provision overruled the "flash of creative genius" test of invention,[166] and led the Federal Circuit to hold that the subjective condition of the inventor's mind at the time of invention is irrelevant to patentability.[167] Further, the Federal Circuit has stated that the skill of the inventor is irrelevant in determining the level of ordinary skill in the art.[168] Thus, "one should not go about determining obviousness under section 103 by inquiring into what *patentees* (i.e., inventors) would have known or would likely have done, faced with the revelations of references."[169] Because an inventor's level of education serves as an indication of her skill and knowledge, to accord with statute and precedent, this factor should be removed from the determination of ordinary skill in the art.

The inventor's education factor also flies in the face of the purpose underlying the *Graham* factors: preventing the fact-finder from employing hindsight in the nonobviousness inquiry.[170] This factor practically invites juries and judges to equate Phosita with the inventor.[171] When this happens, as in *ICI*,[172] conclusions of obviousness are tainted by the suspicion that the decision-maker reconstructed the invention using the inventor's patent as a blueprint.[173] The continuing reliance of the PTO and the lower courts on this factor—through its use in the Manual of Patent Examining Procedure and jury instructions—underscores the potential for engaging in inadvertent hindsight.[174] The inventor's educational level may be higher or lower than that of the hypothetical person. To the extent that an inventor's educational credentials are used to determine the level of ordinary skill, that level

165. 35 U.S.C. § 103(c).

166. *Graham*, 383 U.S. at 15. The "flash of creative genius" test required the inventor to have conceived of an invention in a near instantaneous fashion to render the invention patentable, and originated in *Cuno Eng'g Corp. v. Automatic Devices Corp.*, 314 U.S. 84, 91 (1941).

167. *See* Ryko Mfg. Co. v. Nu-Star, Inc., 950 F.2d 714, 718 (Fed. Cir. 1991) (citing Kloster Speedsteel AB v. Crucible Inc., 793 F.2d 1565, 1574 (Fed. Cir. 1986)).

168. Standard Oil Co. v. Am. Cyanamid Co., 774 F.2d 448, 454 (Fed. Cir. 1985); Stewart-Warner Corp. v. City of Pontiac, 767 F.2d 1563, 1570 (Fed. Cir. 1985) ("[S]ection 103 is not concerned with the actual skill of the inventors—whose skill may be extraordinary—but rather with the level of ordinary skill in the art.").

169. *Standard Oil*, 774 F.2d at 454 (emphasis in original).

170. Ruiz v. A.B. Chance Co., 234 F.3d 654, 664 (Fed. Cir. 2000).

171. *See supra* Part II.B.1.

172. Imperial Chem. Indus., PLC v. Danbury Pharmacal, Inc., 777 F. Supp. 330, 371–72 (D. Del. 1991).

173. *See supra* Part II.B.1.

174. *See id.*

may be quite different from the actual level in a particular field.[175] While the Federal Circuit has occasionally de-emphasized this factor, it should end the possibility for confusion of the inventor's skill with that of Phosita once and for all by rejecting the inventor's education level as a factor in the Phosita determination.

B. *The Educational Level of Active Workers Is Insufficient To Define a Phosita's Technical Know-How*

Determining the educational level of workers active in the field is only a starting point for defining the level of ordinary skill. Lower courts, to the extent that they make findings on this factor, often go beyond a bare bones description of educational level.[176] They include not only a variety of educational backgrounds that a Phosita may possess, but also the specialized knowledge and length of experience such a person would have.[177] This analysis is appropriate because the specialized knowledge needed to practice in a particular art often comes from job experience rather than formal education. In addition, although a scientist with a graduate degree possesses certain fundamental knowledge common throughout a field, such a scientist also possesses know-how unique to the handful of sub-disciplines in which she works.[178] Thus, formal education rarely defines the total technical knowledge of a Phosita and should not be used as a proxy for a Phosita's level of skill.

C. *Two Factors of* Environmental Designs *Are Not Probative of the Level of Ordinary Skill in the Art Inquiry*

Two factors set forth in *Environmental Designs*—the rapidity with which innovations are made and the sophistication of the technology—are not probative of the level of ordinary skill in the art. These factors are

175. *See* Kimberly-Clark Corp. v. Johnson & Johnson, 745 F.2d 1437, 1454 (Fed. Cir. 1984) (noting that "[r]eal inventors, as a class, vary in their capacities from ignorant geniuses to Nobel laureates").

176. *See, e.g.*, Bose Corp. v. JBL, Inc., 112 F. Supp. 2d 138, 155 (D. Mass. 2000) (finding that Phosita could have a variety of educational backgrounds, would be familiar with aerodynamics, fluid flow mechanics, and acoustics, and would have two to three years experience in loudspeaker design).

177. *See, e.g., id.*

178. *See, e.g.*, Rochelle Cooper Dreyfuss, *Collaborative Research: Conflicts on Authorship, Ownership, and Accountability*, 53 VAND. L. REV. 1161, 1171 (2000) (noting that in biomedicine it is impossible for any one person to know enough to advance the field).

ambiguous and therefore indeterminate, and the Federal Circuit has not adequately explained how to apply them. Therefore, the factors provide no assistance to district courts or the patent office in deciding whether claimed subject matter would have been obvious to one of ordinary skill in the art at the time of the invention.

The "rapidity with which innovations are made" factor does not exhibit a simple relationship to the level of ordinary skill in the art.[179] If a field is rapidly advancing, does that imply a high level of skill by practitioners or does it simply mean that a large amount of money is being invested in research? Alternatively, there may be a low level of skill because the field is young, but the field may be advancing rapidly because the easy experiments are being done first or a new analytical technique has cleared the path for investigation. The Federal Circuit has been silent as to which, if any, of these presumptions to employ in a particular situation, and rapidity of innovation has rarely been argued in the district courts.[180] Therefore, the factor is ambiguous and confusing to courts attempting to define Phosita and should be abandoned.

Like the "rapidity of innovations" factor, it is unclear as to which direction "sophistication of the technology" should lead a court in determining Phosita. If the technology in an art is less sophisticated, does that mean its practitioners are less sophisticated and therefore more likely to find inventions nonobvious? On the other hand, does a less sophisticated art imply that one of ordinary skill will find more inventions obvious because the technology is so easy to understand? Alternatively, are the practitioners of a sophisticated art also more sophisticated and therefore more likely to find inventions in that art obvious? Or, finally, does the sophistication of the art make it more likely that one of ordinary skill in the art will find inventions nonobvious because of the complexity of the art? The Federal Circuit has not answered these questions.

The Federal Circuit has also not explained how the sophistication of technology in an art should influence the finding of the level of ordinary skill in the art. At the end of the year 2000, only five of the court's nonobviousness opinions cited the factors of *Environmental Designs*, and none commented further on the sophistication factor.[181] In a slightly

179. *See, e.g.*, Schlicher, *supra* note 13, at 131 (noting that it is unclear how to apply the rapidity of innovation factor).

180. *See supra* Part II.B.3.

181. *See supra* note 126.

different context, the Federal Circuit has stated that, without more, a high level of skill in a sophisticated art is insufficient to render an invention obvious from selected prior art references.[182] Without making reference to level of skill at all, the Federal Circuit has also found that a technologically simple invention cannot be rendered obvious because of its simplicity alone.[183] While consistent with the court's requirement of evidence of some suggestion or motivation to combine prior art references,[184] these statements appear to make the sophistication of the technology irrelevant to the level of ordinary skill. Further, they imply, at the very least, a diminished role for using the level of skill in the art in reaching a nonobviousness judgment.

Although the Federal Circuit has developed a six-factor test for defining Phosita, several factors have proven to be unnecessary or unhelpful. Others require further development before they can be properly applied. The Federal Circuit should continue to develop the Phosita factors to more accurately reflect the level of ordinary skill in the art.

IV. THE FEDERAL CIRCUIT SHOULD REPLACE THE *ENVIRONMENTAL DESIGNS* FACTORS TO BETTER REFLECT THE PERSPECTIVE OF PHOSITA

The Federal Circuit should replace most of the *Environmental Designs* factors with subtests designed to more closely reflect the challenge presented by an inventive problem and how Phosita thinks about the problem. The revised factors should include (1) the predictability of the art; (2) experience of active workers in the field; (3) the prior art problems and solutions; and (4) long-felt need and failure of others as direct evidence of the ordinary skill in the art. Together, these factors advance the nonobviousness inquiry by focusing on whether the level of ordinary skill can bridge the logical gap between the prior art and the invention.

A. The Predictability of an Art Bears Directly on the Skill of Phosita

Although the sophistication of a technology is not a useful factor in measuring the level of ordinary skill in an art, the idea that the state of an

182. *See In re* Rouffet, 149 F.3d 1350, 1359 (Fed. Cir. 1998).

183. *See In re* Dembiczak, 175 F.3d 994, 999 (Fed. Cir. 1999).

184. Ruiz v. A.B. Chance Co., 234 F.3d 654, 665 (Fed. Cir. 2000).

art may affect its obviousness to Phosita is reasonable. The predictability of a technology, unlike its sophistication, has a direct bearing on whether the worker of ordinary skill will find an invention obvious.[185] A field may be complex, but relatively predictable in its application.[186] To solve a problem of type X in computer programming, it may be typical to apply algorithm Y. The algorithm may have many parts, requiring a sophisticated understanding of mathematics to know when it should be applied. Yet the algorithm will often work in a new context as a Phosita expects, making developments using the algorithm more likely to be found obvious.[187] In contrast, organic chemists often find that standard, chemical transformations do not succeed in new classes of molecules.[188] In other words, in an unpredictable art like organic chemistry, a solution to a problem may be obvious to try, yet nonobvious if Phosita cannot have a reasonable expectation of success under the circumstances.[189]

To be useful to the Phosita determination, the fact-finder should not simply categorize whole disciplines as predictable or unpredictable. Courts should recognize that the level of predictability in an art can change over time. A fact-finder should examine the predictability of the particular field of invention on a case-by-case basis. For example, biotechnology has been classified as an unpredictable art.[190] However, a wide range of understanding exists with regard to various aspects of this technology, and each sub-area is constantly advancing.[191] That which was unpredictable early on may well mature into a predictable area in the future.[192] For example, the Federal Circuit in *Amgen, Inc. v. Chugai Pharmaceutical Co.*,[193] and later *Fiers v. Revel*,[194] ruled that conception,

185. *See, e.g.*, Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1053 (Fed. Cir. 1988) (finding that the inability of an expert in the field "to predict the result [the invention] would have on a tractor-trailer vehicle" suggests the nonobviousness of the invention).

186. *See, e.g.*, N. Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 941–43 (Fed. Cir. 1990) (holding certain claims valid, in the context of enablement, although the specification did not disclose a key subroutine in a program because the court found that one of ordinary skill would understand how to write such a subroutine without undue experimentation).

187. *See, e.g., id.*

188. Derived from personal experience of the author, a Ph.D. organic chemist.

189. *See, e.g.*, Amgen, Inc. v. Chugai, 927 F.2d 1200, 1207–09 (Fed. Cir. 1991).

190. *See, e.g.*, Brian P. O'Shaughnessy, *The False Inventive Genus: Developing a New Approach for Analyzing the Sufficiency of Patent Disclosure Within the Unpredictable Arts*, 7 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 147 n.12 (1996).

191. *See, e.g., id.*

192. *See, e.g.*, Enzo Biochem, Inc. v. Calgene, Inc., 188 F.3d 1362, 1374 n.10 (Fed. Cir. 1999).

193. *Amgen, Inc.*, 927 F.2d at 1200.

194. 984 F.2d 1164 (Fed. Cir. 1993).

and therefore invention, of a new gene sequence does not occur until the inventor clones and isolates the gene.[195] From this reasoning flowed, in part, the holdings of In re *Bell*[196] and In re *Deuel*.[197] Those opinions held that a gene sequence is nonobvious when only a protein sequence is known, despite the fact that one skilled in the art could clone the gene based on such knowledge.[198] One commentator has argued that these holdings may lack precedential value in the future because cloning has become much more routine and predictable since the times of the inventions at issue in *Bell* and *Deuel*.[199] This example illustrates that the predictability of an art more accurately reflects the level of skill in the art than simply the level of sophistication of the technology.

Predictability of technology should be a relatively easy factor to apply because the courts can look to analogous determinations within similar contexts. For example, the predictability of a technology is one of the factors that a trial court must take into account in determining if a patent specification enables one of ordinary skill in the art to make and use the full scope of the claimed invention without undue experimentation.[200] Unpredictable technology narrows the claim scope permitted a patentee because it is less likely that the invention will work in situations beyond that for which the patentee provided actual examples in the specification.[201] Similarly, unpredictable technology indicates a lower skill in the art and makes a conclusion of nonobviousness more likely. By qualitatively assessing the predictability of the field of an invention, the decision-maker can better judge the size of the leap between prior art and the invention that Phosita could have made at the time of the invention. Thus, by providing a less ambiguous and more objective test

195. *Amgen*, 927 F.2d at 1206–07; *Fiers*, 984 F.2d at 1168–69.

196. 991 F.2d 781 (Fed. Cir. 1993).

197. 51 F.3d 1552 (Fed. Cir. 1995).

198. *See id.* at 1560; *see also Bell*, 991 F.2d at 784–85. The court qualified this holding by stating that the amino acids of the protein sequence must be coded for by degenerate DNA codons. *Deuel*, 51 F.3d at 1560. For a basic explanation of the science involved in these decisions, see Anita Varma & David Abraham, *DNA Is Different: Legal Obviousness and the Balance Between Biotech Inventors and the Market*, 9 HARV. J.L. & TECH. 53, 56–65 (1996).

199. Jeffrey S. Dillen, Comment, *DNA Patentability—Anything But Obvious*, 1997 WIS. L. REV. 1023, 1041–44 (1997).

200. *In re* Wands, 858 F.2d 731, 737 (Fed. Cir. 1988).

201. *See, e.g.*, Enzo Biochem, Inc. v. Calgene, Inc., 188 F.3d 1362, 1373–75 (Fed. Cir. 1999) (holding that claims for antisense DNA technology in mammalian cells were invalid for lack of enablement when the specification only provided examples in bacterial cells because of the unpredictable nature of the technology).

than sophistication of technology, predictability of technology more adequately fulfills the purpose of the Phosita inquiry.

B. *Experience of Active Workers in the Field Focuses on Problem-Solving Ability Rather Than Credentials*

The Federal Circuit should make the experience of active workers in the field a factor in the Phosita inquiry. This factor should incorporate the training the typical worker has received, the length of time spent in the field, and any specialized knowledge or techniques that such a worker normally possesses. If advances in the field are typically made by interdisciplinary teams, then each of the necessary disciplines should be represented. These components would ensure that all pertinent art is considered in the nonobviousness assessment.

Knowledge of the type of training the typical worker has received helps to define which technological fields are analogous art and therefore which fields a Phosita is deemed to know. This is especially important in areas of technology where inventions are made by interdisciplinary teams. For example, while it may be nonobvious to a software engineer to write a program that implements a Dutch auction on the internet, the idea may be obvious to a team consisting of a software engineer and an MBA.[202] Further, evidence of the typical worker's experience will help to define the boundaries of prior art problems and solutions to which the problem to be solved is related.[203] Finally, the emphasis on experience underscores the importance of assessing how the Phosita goes about solving problems in her field rather than the credentials she possesses. Therefore, by focusing on a more pertinent indicator of skill than mere credentials, the suggested experience factor also furthers the purpose of the Phosita determination.

C. *A Consideration of Prior Art Problems and Solutions Allows an Assessment of the Logical Leap Phosita Must Make Between the Prior Art and an Invention*

The Federal Circuit should emphasize and explain how to use the factors relating to types of problems encountered in the art and the prior

202. *See, e.g.*, William D. Wiese, *Death of a Myth: The Patenting of Internet Business Models After State Street Bank*, 4 MARQ. INTELL. PROP. L. REV. 17, 43–44 (2000) (arguing that Priceline.com's reverse auction patent may be invalid for obviousness).

203. *See infra* Part IV.C.

art solutions to those problems. As Judge Learned Hand pointed out over forty years ago, it would be nearly impossible to assess the ingenuity of Phosita "except by recourse to the earlier work in the art, and to the general history of all the means available at the time."[204] Evidence on these factors indicates whether Phosita would be likely to inductively reason from the prior art to arrive at the inventor's solution. In other words, a consideration of prior problems and solutions helps determine the size of the logical gap Phosita must bridge to the invention—potentially a quite different exercise than merely judging the differences between the prior art and the invention.

The Federal Circuit has not employed the prior art problems/solutions factor in a useful way. In its only discussion of the factors, the Federal Circuit in In re *GPAC* argued that the level of skill in asbestos containment systems was high because of the hazardous and difficult nature of the work and because it is a highly regulated industry.[205] Thus, the inference of high skill was not based on a discussion of the substance of the problems and solutions, but on the court's characterization of the safety aspects of the problems.[206]

In *Jacobson Brothers, Inc. v. United States*,[207] the Court of Claims followed a more useful analytical route. In determining the Phosita from the prior art, it compared a previous problem in the art of underwater salvage to that solved by the claimed invention.[208] The court found that each problem concerned the maneuvering of an underwater device in the presence of underwater currents and tides.[209] The court compared the prior art solution to the patented solution and found them to employ essentially identical systems of cables, pulleys, and winches.[210] Because the court determined not only that the differences between the prior art device and the patented invention were small, but also that the problems each solved were the same, it concluded that the inductive leap Phosita would need to make between the prior art and the invention was small. Therefore, the invention was obvious.[211]

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204. Reiner v. I. Leon Co., 285 F.2d 501, 503–04 (2d Cir. 1960).

205. *In re* GPAC Inc., 57 F.3d 1573, 1579 (Fed. Cir. 1995).

206. *See supra* Part II.B.4.

207. 512 F.2d 1065, 1071 (Ct. Cl. 1975) (adopting opinion originally published in 184 U.S.P.Q. (BNA) 181, 185 (Ct. Cl. 1974)).

208. *Id.*

209. *Id.*

210. *Id.* at 1071–72.

211. *Id.* at 1073.

The focus of the prior art problems/solutions factor on assessing the size of this inductive leap distinguishes it from the current motivation/suggestion test of obviousness so heavily relied on by the Federal Circuit. Although both the problems/solutions factor and the motivation/suggestion test focus on the prior art, a motivation/suggestion analysis of the facts of *Jacobson* shows how the two tests may yield different results because of their different approaches. In the *Jacobson* case, there was no explicit teaching or suggestion in the prior art references themselves to combine the maneuvering system and the underwater TV rig.[212] Hence, the patent at issue would likely have been held valid using the motivation/suggestion test.[213] These differing results suggest that the prior art problems/solutions factor may be a more stringent approach to nonobviousness than the motivation/suggestion test. If, as some have suggested, the motivation/suggestion test sets a lower standard for nonobviousness than required by *Hotchkiss v. Greenwood*,[214] and later Congress,[215] the problems/solutions factor would help raise the Phosita standard and therefore the nonobviousness standard.

D. Long-Felt Need and Failure of Others To Make the Invention Provide Primary Evidence of the Actual Level of Skill in the Art

Long-felt need and failure of others to make the invention should not be utilized as "secondary" considerations, but rather as objective evidence of actual skill in the art. Like the predictability factor, long-felt need and failure of others bear directly on the question of skill level.[216] When a problem is old in the art and has been the subject of more than de minimus research, it suggests that no one of any skill level was able to

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212. *See id.* at 1068–69 (finding that prior art underwater television systems did not utilize the prior art maneuvering systems for diving bells).

213. The motivation/suggestion test could give the same result if motivation is found "in the nature of the problem to be solved." However, although the Federal Circuit has often cited this aspect of the test, it has seldom relied on it to find obviousness. *See, e.g.*, Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc., 75 F.3d 1568, 1573 (Fed. Cir. 1996) (finding that patent on storage container for sports trading cards was invalid for obviousness because nature of subject matter—the size of the cards—suggested the combination of a prior art card holder with a reference describing a card holder no longer than necessary to enclose the card).

214. 52 U.S. (11 How.) 248 (1851).

215. *See, e.g.*, KENNETH J. BURCHFIEL, BIOTECHNOLOGY AND THE FEDERAL CIRCUIT 84–85 (1995).

216. One treatise writer has previously suggested that these factors are direct and primary evidence of skill in the art. *See* 2 DONALD S. CHISUM, CHISUM ON PATENTS 5-214 (2000).

solve it.[217] When combined with actual evidence that others failed to solve the problem, one can infer that the solution has eluded those of ordinary skill.[218] As one commentator suggested, "failure of others to make an invention proves *directly* that parallel research efforts were under way at a number of firms, and that one firm (the patentee) won the race to a common goal."[219]

Many courts have long recognized the reliability of long-felt need and failure of others factors as indicators of nonobviousness in general. Judge Learned Hand repeatedly noted that, without factors such as these, courts of laymen are likely to underrate or overrate "the difficulties involved in making new and profitable discoveries in fields with which they cannot be familiar . . . ."[220] The advantage of these factors is that they relieve the decision-maker of the difficult step of determining the logical gap between the prior art and the invention. In addition, such evidence is relatively easy to obtain, at least in the case of corporate research, where most companies keep detailed records.[221] Placing these factors inside the Phosita determination should reduce some of the wavering of the Federal Circuit on how much weight to accord secondary factors,[222] and may encourage greater use of this type of evidence.

V. CONCLUSION

Overall, the factors set forth in *Environmental Designs* for resolving the level of ordinary skill in the art have not been terribly helpful to the lower courts. The "rapidity of innovation" and "sophistication of technology" factors are routinely ignored—probably because of their enigmatic meaning for both the Phosita determination in particular and nonobviousness in general. While most courts have discussed the scope and content of the prior art and its differences from the invention at issue, few have taken the approach of *Jacobson* and tried to assess the size of the logical leap between the prior art and the invention. The inventor's

217. Merges, *supra* note 56, at 862–63.

218. *Id.*

219. *Id.* at 862.

220. *See, e.g.*, Reiner v. I. Leon Co., 285 F.2d 501, 503–04 (2d Cir. 1960) (Hand, J.); Safety Car Heating & Lighting Co. v. Gen. Elec. Co., 155 F.2d 937, 939 (2d Cir. 1946).

221. Merges, *supra* note 56, at 864.

222. *Compare* Stratoflex, Inc., v. Aeroquip Corp., 713 F.2d 1530, 1538 (Fed. Cir. 1983) (holding that secondary considerations are "often . . . the most probative and cogent evidence in the record") *with* Newell Cos. v. Kenney Mfg. Cos., 864 F.2d 757, 768 (Fed. Cir. 1988) ("Although [secondary] factors must be considered, they do not control the obviousness conclusion.").

educational level is legally infirm and apt to confuse courts into equating the inventor's skill with that of a Phosita. Courts often make findings on the educational level of active workers in the field but the use of this information, other than acting as a rough proxy for high or low skill, has been limited. Factors that more closely reflect the challenge of problems faced by a Phosita and the way such a "person" thinks about problems would provide valuable insight into the nonobviousness of an invention.

The suggested factors are put forward as one way to bring more objectivity to an inherently subjective assessment. An approach that systematically attempts to define the logical gap that existed at the time of the invention between the prior art and the invention achieves this goal. This gap is not the difference between the prior art and the invention, which may be slight, but is the Phosita's understanding or lack thereof which separates the invention from the prior art. These factors should allow the ordinary level of skill in the art to be assessed in a more meaningful fashion for the purpose of determining nonobviousness. They should therefore permit a more accurate, and hopefully more predictable, assessment of the nonobviousness of an invention while adhering to the *Graham* analysis mandated by the United States Supreme Court.