THE TEACHING FUNCTION OF PATENTS

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In theory, a patent serves the public good because the disclosure of the invention brings new ideas and technologies to the public and induces inventive activity. But while these roles inherently depend on the ability of the patent to disseminate technical knowledge, the teaching function of patents has received very little attention. Indeed, when the document publishes, it can serve as a form of technical literature. Because patents can, at times, communicate knowledge as well as, or better than, other information sources, patents could become a competitive source of technical information. Presently, however, patents are rarely viewed in this manner. There are several reasons for this, including the lack of a working example requirement and the pervasive use of ambiguous or opaque language.

My primary objective is to transform patents into readable teaching documents. Importantly, if patents are to compete with the technical literature, then they must provide the same quality of teaching. For this to happen, two things must occur. First, at least for complex inventions, an applicant must prove, through adequate detail, that the claimed invention has been constructed and works for its intended purpose. Second, applicants must be allowed to draft the document using clear and concise language, without the fear of litigation troubles. To achieve both, I contend that working examples should replace language as the principal measure of claim scope. To implement this idea, I propose a new examination protocol which gives the U.S. Patent Office the ability to request working examples when the disclosure's teaching appears dubious. In exploring criticisms, I argue that, in contrast

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to the current disclosure framework, which can itself thwart innovation, the proposed regime will produce more technically robust patents, which will make it easier for subsequent inventors to improve upon existing patented technology, promote the diffusion of knowledge across disciplines, and serve as a driver for more creative innovation.

INTRODUCTION

The patent document serves several stated functions. First, it discloses the invention to the public.[1] This disclosure must be sufficiently detailed to enable one of ordinary skill in the art to practice

1 The courts often refer to disclosure as the quid pro quo for the inventor's right to exclude. *See* Pfaff v. Wells Elecs., Inc., 525 U.S. 55, 63 (1998) ("[T]he patent system represents a carefully crafted bargain that encourages both the creation and the public disclosure of new and useful advances in technology, in return for an exclusive monopoly for a limited period of time.").

the invention and provide the best way to do so.[2] Second, it includes claims which define the scope of the exclusory right and notify interested members of the public of the activities that will infringe.[3] Third, the document serves as a starting point for patent prosecution,[4] as well as a court's adjudication of patent validity and infringement.[5]

Yet patents perform functions which extend beyond the legal sphere. These include, for example, signaling research and develop-

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2 The statutory disclosure requirement has four parts, which appear in the first and second paragraphs of 35 U.S.C. § 112:

> The specification shall contain a *written description* of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to *enable* any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the *best mode* contemplated by the inventor of carrying out his invention.
>
> 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.

35 U.S.C. § 112 (2006) (emphasis added). As the statute indicates, the key elements of an issued patent (or patent application) are: (1) the written description, which completely describes the invention, and (2) the claims, which define the scope of protection.

3 *See id.*; McClain v. Ortmayer, 141 U.S. 419, 424 (1891) ("The object of the patent law in requiring the patentee to [distinctly claim his invention] is not only to secure to him all to which he is entitled, but to apprise the public of what is still open to them."); Merrill v. Yeomans, 94 U.S. 568, 573–74 (1876) ("It seems to us that nothing can be more just and fair, both to the patentee and to the public, than that the former should understand, and correctly describe, just what he has invented, and for what he claims a patent.").

4 Patent law consists of several branches. Patent prosecution describes the process by which an inventor, usually through the help of an attorney, files an application with the U.S. Patent and Trademark Office (Patent Office) for examination. The application contains essentially the same elements as an issued patent, including a written description, drawings, and claims. The patent prosecutor's interaction with the patent examiner is ex parte. *See generally* ALAN L. DURHAM, PATENT LAW ESSENTIALS § 5 (3d ed. 2009) (explaining the patent prosecution process). Patent litigation focuses on issued patents. A patent owner whose rights have been infringed can compel an accused infringer to stop the infringing activity and pay for damages arising from the infringement that has already occurred. *See id.* § 11. On the other hand, a potential infringer can launch a "preemptive strike" against the patentee to seek a declaratory judgment that the patent is invalid. *Id.* Finally, patent licensing allows patent owners to generate royalty income by allowing others to practice the invention. *Id.* § 6.3

5 *See supra* note 4; *see also* Phillips v. AWH Corp., 415 F.3d 1303, 1315 (Fed. Cir. 2005) (en banc) (explaining that the patent's written description "'is always highly relevant to the claim construction analysis . . . [and usually is] dispositive [because] it is the single best guide to the meaning of a disputed [claim] term'" (quoting Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996))).

ment (R&D) strength to customers and competitors[6] and inducing inventive activity.[7] This Article focuses on one function that has received considerably less attention: teaching. The basic idea is that, while the patentee can exclude others from practicing the invention until the patent term expires, the technical information disclosed in the patent document has potential immediate value to the public,[8] which can use the information for any purpose that does not infringe upon the claims.[9] Thus, the patent document itself can serve as a form of technical literature and add to the storehouse of knowledge.[10]

But while patents are in many ways quite similar to other technical information sources,[11] it is fair to say that they are not often viewed as an important channel for information flow.[12] Several commenta-

6 *See* Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625, 647–49 (2002).

7 *See, e.g.*, Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 267–71 (1977) (articulating the prospect theory of patent law).

8 CRAIG ALLEN NARD, THE LAW OF PATENTS 50 (2008). Reading patent applications also has practical advantages:

> Because every patent application contains a complete description of someone's technology, and because patent applications are published, and now appear in on-line databases, you can trawl [through them] for information vital to your own research and development efforts. Why struggle to solve a technical problem already solved by another and published in an application?

Anthony Murphy, *Intellectual Property*, *in* INNOVATION: HARNESSING CREATIVITY FOR BUSINESS GROWTH 87, 92 (Adam Jolly ed., 2003).

9 Kirin-Amgen Inc. v. Hoechst Marion Roussel Ltd., [2004] UKHL 46, [2005] R.P.C. 9 at ¶ 77 (Hoffmann, L.J.); *see also* Diane Leenheer Zimmerman, *Is There a Right to Have Something to Say? One View of the Public Domain*, 73 FORDHAM L. REV. 297, 303 n.23 (2004) ("A patent application must disclose the nature of the invention in detail, and although the public cannot practice the art during the period of the patent, it can use the information disclosed in a variety of other ways.").

10 *See* Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 481 (1974) (explaining that as the information disclosed in a patent becomes publicly available it adds to the "general store of knowledge" and, assumedly, "will stimulate ideas and the eventual development of further significant advances in the art"); Graham v. John Deere Co., 383 U.S. 1, 6 (1966) (noting that the Intellectual Property Clause of the Constitution, U.S. CONST. art. I, § 8, cl. 8, requires that patents add to knowledge).

11 Like technical journals, for example, patents show the state of technology, set forth what others have already achieved, and provide technical information that others can avoid repeating. THOMAS T. GORDON & ARTHUR S. COOKFAIR, PATENT FUNDAMENTALS FOR SCIENTISTS & ENGINEERS 51 (2d ed. 2000). For additional similarities, see *infra* notes 217–19 and accompanying text.

12 *See* Wesley M. Cohen et al., *R&D Spillovers, Patents and the Incentives to Innovate in Japan and the United States*, 31 RES. POL'Y 1349, 1362–64 (2002) (presenting empirical research which shows that among information sources for diffusing research and development, in the United States, patents rank third behind publications and informal information exchange).

tors speculate as to why this is so.[13] Yet patents can, at times, communicate knowledge as well as, or better than, other information sources, and serve as a rich font of technical knowledge.[14]

Yet, for a variety of reasons, the patent literature is often overlooked or ignored. First, scientists and engineers are not trained to read patents. In college and graduate school they learn that research funding, reputation, and tenure decisions turn on publications in peer-reviewed technical journals.[15] This influence often carries over into industry.[16]

Second, many companies, as a matter of policy, have discouraged their employees from reading the patent literature out of fear that knowledge of a patent could lay the groundwork for a finding of willful infringement if that patent were litigated.[17] With this in mind, companies have had to weigh the potential benefits of reading a patent against the risk of enhanced damages.[18] However, a recent decision from the U.S. Court of Appeals for the Federal Circuit makes it substantially more difficult for a patentee to prove willfulness and suggests that simply reading a patent will not trigger the doctrine.[19]

Third, a disclosure which cannot teach a person having ordinary skill in the art (PHOSITA)[20] how to practice the invention has little

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13 *See infra* note 227.

14 *See* discussion *infra* Part II.C.4.

15 *See infra* note 223 and accompanying text.

16 *See* GORDON & COOKFAIR, *supra* note 11, at 52. It appears that attitudes are changing in the academy, in part due to decreased federal funding, industrial collaborations, and potential revenue streams from patent licensing. *See* Sean B. Seymore, *The "Printed Publication" Bar After* Klopfenstein*: Has the Federal Circuit Changed the Way Professors Should Talk About Science?*, 40 AKRON L. REV. 493, 499–501 (2007) (discussing the rise and impact of university technology transfer offices).

17 Michael Risch, *The Failure of Public Notice in Patent Prosecution*, 21 HARV. J.L. & TECH. 179, 213 & n.198 (2007); Edwin H. Taylor & Glenn E. Von Tersch, *A Proposal to Shore Up the Foundations of Patent Law that the* Underwater *Line Eroded*, 20 HASTINGS COMM. & ENT. L.J. 721, 737 (1998); *see also* Note, *The Disclosure Function of the Patent System (or Lack Thereof)*, 118 HARV. L. REV. 2007, 2017–23 (2005). For a broader discussion of the doctrine and its ill effects on the dissemination of knowledge, see FED. TRADE COMM'N, TO PROMOTE INNOVATION 28–31 (2003); Mark A. Lemley & Ragesh K. Tangri, *Ending Patent Law's Willfulness Game*, 18 BERKELEY TECH. L.J. 1085, 1101–02 (2003).

18 *See* Kimberly A. Moore, *Empirical Statistics on Willful Patent Infringement*, 14 FED. CIR. B.J. 227, 232 (2004); *The Disclosure Function of the Patent System*, *supra* note 17, at 2019.

19 *See In re* Seagate Tech., 497 F.3d 1360, 1371 (Fed. Cir. 2007) (en banc) (holding that "proof of willful infringement permitting enhanced damages requires at least a showing of objective recklessness").

20 The PHOSITA is a hypothetical construct of patent law akin to the reasonably prudent person standard used in torts. Factors relevant to constructing the PHOSITA

substantive value.[21] Indeed, one criticism of patents is that they "seldom teach enough so that someone can actually go out and actually do the invention without some additional work."[22] This is true, at least in part, because an inventor need not create a working embodiment,[23] or engage in any experimentation, before obtaining the patent. Rather, an inventor can describe an invention with fictitious, constructed examples. And, if these examples lack sufficient detail, a PHOSITA can presumably rely on knowledge in the field to fill in the missing information.[24] But when this presumption fails, the PHOSITA can spend a lot of time and effort figuring out how to make and use the invention.

Fourth, jargon and formalism often make patents indecipherable, even to those with specialized knowledge.[25] So, even if a patent disclosure satisfies the statutory disclosure requirements, the document itself has little technical value if it is unreadable.[26] In a practical

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in a particular technical field include the sophistication of the technology and the educational level of active workers in the field. *See* Envtl. Designs, Ltd. v. Union Oil Co., 713 F.2d 693, 696 (Fed. Cir. 1983) (listing six factors relevant to a determination of ordinary skill in the art).

21 *See, e.g.*, Mark A. Lemley, *Ignoring Patents*, 2008 MICH. ST. L. REV. 19, 22 n.16 ("[R]esearch suggests that scientists don't in fact gain much of their knowledge from patents, turning instead to other sources.").

22 *See The Disclosure Function of the Patent System*, *supra* note 17, at 2025 & n.103 (quoting *Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy: Hearing Before the Fed. Trade Comm'n* 49–50, 53 (Mar. 20, 2002) (statement of Daniel McCurdy)). Unfortunately, there are times when the patentee deliberately provides an inadequate disclosure. *See infra* note 62.

23 An "embodiment" is a concrete form of an invention (like a chemical compound or a widget) described in a patent application or patent. ROBERT PATRICK MERGES & JOHN FITZGERALD DUFFY, PATENT LAW AND POLICY 26–27 (3d ed. 2002).

24 The specification need not "necessarily describe how to make and use every possible variant of the claimed invention, for the artisan's knowledge of the prior art and routine experimentation can often fill gaps." AK Steel Corp. v. Sollac, 344 F.3d 1234, 1244 (Fed. Cir. 2003).

25 *See, e.g.*, Daniel C. Munson, *The Patent-Trade Secret Decision: An Industrial Perspective*, 78 J. PAT. & TRADEMARK OFF. SOC'Y 689, 713–14 (1996) (observing that chemical patents tend to be "shrouded in chemical nomenclature," which makes them hard to comprehend); *The Disclosure Function of the Patent System*, *supra* note 17, at 2022 (explaining that patents "'are notoriously hard to interpret'" (quoting Matthew D. Powers & Steven C. Carlson, *The Evolution and Impact of the Doctrine of Willful Patent Infringement*, 51 SYRACUSE L. REV. 53, 102 (2001))). Peer-reviewed scientific publications have faced similar criticisms, but the journals are taking steps to tackle the problem. *See, e.g.*, Jonathan Knight, *Clear as Mud*, 423 NATURE 376, 376–78 (2003) (describing various efforts to help scientists improve their manuscripts).

26 *Cf.* Martin W. Gregory, Commentary, *The Infectiousness of Pompous Prose*, 360 NATURE 11, 12 (1992) (making a similar argument for scientific journal articles).

sense, this incomprehensibility could become relevant when a patentee tries to attract and negotiate terms with potential licensees.[27]

It is now time to transform the patent into a readable teaching document. This Article seeks to show that a new standard of disclosure will allow patents to achieve this goal. This Article, the first to closely consider teaching as an important function of the patent system,[28] is the next piece in a larger project, undertaken to bridge the disconnect between patent law and the norms of science.[29] Part I begins by elucidating why patents are difficult to understand. Part II proposes that raising the standard of disclosure, by allowing the U.S. Patent and Trademark Office (Patent Office) to request working examples, will improve the teaching function of patents. In this Part, I contend that changing the examination protocol will allow patents to quickly become competitive sources of technical information. Part III explores some of the concerns that accompany the proposal. I argue that, in contrast to the current disclosure framework, which can itself thwart innovation, the proposed regime will produce more technically robust patents, which will make it easier for subsequent inventors to improve upon existing patented technology.

27 Several commentators contend that licensing to non-inventors works best when the technical information disclosed in the patent is understandable. *See, e.g.*, SCOTT SHANE, ACADEMIC ENTREPRENEURSHIP 111 (2004). When it is not, potential licensees might seek to involve the inventor in the contracting relationship to gain access to the latter's know-how or tacit knowledge. *See* Ashish Arora, *Contracting for Tacit Knowledge: The Provision of Technical Services in Technology Licensing Contracts*, 50 J. DEV. ECON. 233, 246 (1996); Dan L. Burk, *The Role of Patent Law in Knowledge Codification*, 23 BERKELEY TECH. L.J. 1009, 1021 (2008).

28 There is a limited amount of scholarship which addresses patent disclosure issues. *See, e.g.*, Jeanne C. Fromer, *Patent Disclosure*, 94 IOWA L. REV. 539, 563–94 (2009) (proposing a two-layered patent document consisting of a technical layer and a legal layer); Timothy R. Holbrook, *Possession in Patent Law*, 59 SMU L. REV. 123, 131–46 (2006) (arguing that disclosure plays a limited role in patent theory); Katherine J. Strandburg, *Users as Innovators: Implications for Patent Doctrine*, 79 U. COLO. L. REV. 467, 485–88 (2008) (arguing that disclosure is not an issue when the invention is self-disclosed through commercialization); *The Disclosure Function of the Patent System*, *supra* note 17, at 2013–17 (contending that the patent system fails in its mission to disseminate information).

29 *See generally* Sean B. Seymore, *Heightened Enablement in the Unpredictable Arts*, 56 UCLA L. REV. 127 (2008) (analyzing the enablement inquiry that is essential to the disclosure requirement).

I. IDENTIFYING THE PROBLEM

A. No Experimentation Required!

1. Constructive Reduction to Practice

In contrast to the norms of scientific research, which focus on work actually performed, an inventor can obtain a patent without conducting a single experiment.[30] It is well settled in U.S. patent law that conception,[31] and not any physical act, is the key facet of the inventive process.[32] Thus, an applicant who "constructively" reduces an invention to practice by merely filing a patent application presumably has complied with the disclosure requirements of 35 U.S.C. § 112,[33] including the obligation to enable a PHOSITA to make and use the invention without undue experimentation.[34]

Constructive reduction to practice plays a unique role in patent law, as Judge Pauline Newman describes:

> [It] is a legal status unique to the patent art. Unlike the rules for scientific publications, which require actual performance of every experimental detail, patent law and practice are directed to teaching the invention so that it can be practiced. The inclusion of constructed examples in a patent application is an established method of providing the technical content needed to support the conceived scope of the invention.[35]

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30 *See, e.g.*, Gould v. Quigg, 822 F.2d 1074, 1078 (Fed. Cir. 1987) ("'The mere fact that something has not previously been done clearly is not, in itself, a sufficient basis for rejecting all applications purporting to disclose how to do it.'" (quoting *In re* Chilowsky, 229 F.2d 457, 461 (C.C.P.A. 1956))).

31 Conception, often referred to as the "touchstone" of inventorship, is the "formation in the mind of the inventor, of a definite and permanent idea of the complete and operative invention, as it is hereafter to be applied in practice." 1 ROBINSON ON PATENTS 532 (1890); *see also* Burroughs Wellcome Co. v. Barr Labs., Inc., 40 F.3d 1223, 1227–28 (Fed. Cir. 1994) ("Conception is 'the formation in the mind of the inventor of a definite and permanent idea of the complete and operative invention . . . .'") (quoting Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1376 (Fed. Cir. 1986))).

32 *See* Pfaff v. Wells Elecs., Inc., 525 U.S. 55, 60 (1998) (explaining that "the word 'invention' in the Patent Act unquestionably refers to the inventor's conception rather than to a physical embodiment of that idea").

33 *See* 35 U.S.C. § 112 (2006).

34 *Hybritech*, 802 F.2d at 1376. Although the term "undue experimentation" does not appear in the statute, "it is well established that enablement requires that the specification teach those in the art to make and use the invention without undue experimentation." *In re* Wands, 858 F.2d 731, 737 (Fed. Cir. 1988).

35 Hoffmann-La Roche, Inc. v. Promega Corp., 323 F.3d 1354, 1377 (Fed. Cir. 2003) (Newman, J., dissenting).

Yet courts acknowledge that the doctrine is legal fiction.[36] As Professors Dan Burk and Mark Lemley have pointed out, the doctrine recognizes that "the inventor is in some sense speculating or guessing about the features of an invention not yet built."[37] Nonetheless, "the underlying assumption in patent law is that the inventor 'has' the invention mentally, and so can give a sufficiently detailed description of that inventive conception—[thus] physically creating the invention is straightforward."[38] This legal fiction probably emerged during the early days of the patent system when inventions were simple and easy to describe.[39]

Since the doctrine is legal fiction, it is not surprising that constructive reduction to practice has several inherent problems. First, some inventions cannot be constructively reduced to practice because they require confirmation through experiment. For example, it is often true in chemistry and other "unpredictable" fields[40] that a patent which lacks working examples merely invites the PHOSITA to engage in extensive experimentation to figure out how to practice the claimed invention.[41] Second, by not requiring that the inventor have

36 *See, e.g.*, Elan Pharms., Inc. v. Mayo Found., 346 F.3d 1051, 1055 (Fed. Cir. 2003) ("'Even the act of publication or the fiction of constructive reduction to practice will not suffice if the disclosure [is inadequate].'" (quoting *In re* Borst, 345 F.2d 851, 855 (C.C.P.A. 1965))). Nonetheless, the Federal Circuit regularly reiterates that constructive reduction to practice is an established method of disclosure, even in the experimental sciences. *See* Falkner v. Inglis, 448 F.3d 1357, 1366–67 (Fed. Cir. 2006); Univ. of Rochester v. G.D. Searle & Co., 358 F.3d 916, 926 (Fed. Cir. 2004).

37 Dan L. Burk & Mark A. Lemley, *Is Patent Law Technology-Specific?*, 17 BERKELEY TECH. L.J. 1155, 1174 n.77 (2002).

38 *Id.*

39 *See* William D. Noonan, *Patenting Medical Technology*, 11 J. LEGAL MED. 263, 264–69 (1990) (presenting a historical perspective of the patent system's bias toward inventions in applied technologies like mechanical engineering).

40 The courts refer to the experimental sciences as "unpredictable" because PHOSITAs in these fields often cannot predict if a reaction protocol that works for one embodiment will work for others. *See infra* note 113 and accompanying text. On the other hand, inventions in applied technologies like electrical and mechanical engineering are often regarded as "predictable" arts because they are rooted in well-defined, predictable factors. For a deeper exploration of the predictable-unpredictable dichotomy, see Seymore, *supra* note 29, at 136–54; Sean B. Seymore, *The Enablement Pendulum Swings Back*, 6 NW. J. TECH. & INTELL. PROP. 278, 282–84 (2008).

41 *See, e.g.*, *In re* Gardner, 427 F.2d 786, 789 (C.C.P.A. 1970) (determining that applicant's disclosure, which lacked a single specific example or embodiment, fell into the category of "an invitation to experiment" in order to determine how to make use of the alleged invention). The U.S. Court of Customs and Patent Appeals (C.C.P.A.) was a predecessor to the Federal Circuit. The Federal Courts Improvement Act of 1982 abolished the C.C.P.A. *See* Pub. L. No. 97-164, 96 Stat. 25 (1982) (codified as amended in scattered sections of 28 U.S.C.). Soon after its creation, the

a complete and operative invention actually reduced to practice at the time of filing, the resulting patent will probably be too broad in scope. Put another way, the patent will likely protect speculative ideas as opposed to subject matter that is truly enabled.[42] Third, the Patent Office must presume that an invention constructively reduced to practice is enabled unless the examiner can prove otherwise.[43] The examiner bears this burden "even when there is no evidence in the record of operability without undue experimentation."[44] Fourth, as the late Judge Edward Smith wisely observed, "It is the *details* of how to make and use an invention that are of value in the patent disclosure. Bare ideas are not patentable."[45] He further explained:

> Paper patents . . . eviscerate the value of patent disclosures because they necessarily contain untested, speculative details. Paper patents merely add to the clutter of unproved patents in the [Patent Office] and in the courts, requiring fees, examinations, lawyers, trials and appeals, all of which disserve both the inventing and the using communities.[46]

Finally, the disclosure of unproven ideas arguably adds little or nothing to the public storehouse of knowledge.[47]

Federal Circuit adopted the C.C.P.A. decisional law as binding precedent. *See* South Corp. v. United States, 690 F.2d 1368, 1370 (Fed. Cir. 1982) (en banc).

42 Christopher A. Harkins, *Fending Off Paper Patents and Patent Trolls: A Novel "Cold Fusion" Defense Because Changing Times Demand It*, 17 ALB. L.J. SCI. & TECH. 407, 453 (2007).

43 *See In re* Epstein, 32 F.3d 1559, 1570 (Fed. Cir. 1994) (Plager, J., concurring); *In re* Oetiker, 977 F.2d 1443, 1445 (Fed. Cir. 1992); *In re* Marzocchi, 439 F.2d 220, 223–24 (C.C.P.A. 1971).

44 U.S. PATENT & TRADEMARK OFFICE, DEP'T OF COMMERCE, MANUAL OF PATENT EXAMINING PROCEDURE § 2164.04 (8th ed. 2001, rev. 2008) [hereinafter MPEP], *available at* http://www.uspto.gov/web/offices/pac/mpep/mpep.htm. The MPEP provides guidance to patent examiners. While the MPEP does not have the force of law, it is entitled to judicial notice as the Patent Office's official interpretation of statutes and regulations. Molins PLC v. Textron, Inc., 48 F.3d 1172, 1180 n.10 (Fed. Cir. 1995).

45 UMC Elecs. Co. v. United States, 816 F.2d 647, 664–65 (Fed. Cir. 1987) (Smith, J., dissenting) (emphasis added), *abrogated by* Pfaff v. Wells Elecs., Inc., 525 U.S. 55 (1998).

46 *Id.* at 665. A "paper patent" refers to a patent issued for an invention that has not been actually reduced to practice. *See In re* Holladay, 584 F.2d 384, 386 (C.C.P.A. 1978).

47 *See In re* Argoudelis, 434 F.2d 1390, 1394 (C.C.P.A. 1970) (Baldwin, J., concurring) (explaining that the full and complete disclosure of how to make and use the claimed invention "adds a measure of worthwhile knowledge to the public storehouse"); *cf.* Atl. Works v. Brady, 107 U.S. 192, 200 (1882) ("The design of the patent laws is to reward those who make some substantial discovery or invention, which adds

2. Prophetic Examples

Since a patentee's compliance with § 112 does not turn on the presence or absence of working examples,[48] the courts allow inventors to satisfy enablement in other ways. These include the use of prophetic examples, which Professor Timothy Holbrook defines as "forms of the invention that the patentee did not actually invent but which would be within the scope of her disclosure."[49] A patent supported with prophetic examples does not necessarily raise any red flags with respect to (non)enablement.[50]

Yet prophetic examples have several serious drawbacks. First, they are often less helpful than working examples, particularly in the experimental sciences. For example, in chemistry a PHOSITA often cannot take a result from one reaction and predict how similar compounds will react with any reasonable expectation of success.[51] This is true because minor changes in chemical structure can result in large changes in reactivity.[52] Second, the mere ability to write about an idea or craft prophetic examples does not mean that the inventor necessarily possesses the invention.[53] Third, and relatedly, when the inventor

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to our knowledge . . . . It was never the object of those laws to grant a monopoly for every trifling device, every shadow of a shade of an idea . . . .").

48 *See In re* Borkowski, 422 F.2d 904, 908 (C.C.P.A. 1970) (explaining that there is no statutory basis for a working example requirement); *In re* Long, 368 F.2d 892, 894–95 (C.C.P.A. 1966) (same).

49 Holbrook, *supra* note 28, at 158; *see also* MPEP, *supra* note 44, at § 608.01(p) (permitting the use of prophetic examples). The key benefit of prophetic examples is their use in provisional patent applications, which allows an applicant to obtain an early filing date for the invention before the applicant is ready to draft a claim or a full application. *See* 35 U.S.C. § 111 (2006). But the provisional application must include a written description which satisfies the requirements of § 112. *See* New Railhead Mfg., L.L.C. v. Vermeer Mfg. Co., 298 F.3d 1290, 1294 (Fed. Cir. 2002).

50 *See* Atlas Powder Co. v. E.I. Du Pont de Nemours & Co., 750 F.2d 1569, 1577 (Fed. Cir. 1984). Patentees must set forth prophetic examples in the present tense to signal that they were not carried out. Schering Corp. v. Geneva Pharms., Inc., 339 F.3d 1373, 1376 n.1 (Fed. Cir. 2003) (citing *Atlas Powder*, 750 F.2d at 1578).

51 *See* Seymore, *supra* note 29, at 144–46.

52 The courts recognized long ago that chemical compounds that are similar in structure can differ radically in their properties, even when they belong to the same chemical class. If an applicant seeks to claim the class, "it must appear in the [written description] . . . that the chemicals or chemical combinations included therein [are] generally capable of accomplishing the desired result." *In re* Walker, 70 F.2d 1008, 1011 (C.C.P.A. 1934) (internal quotation marks omitted).

53 The "written description" requirement of § 112 ensures that the applicant was in possession of the invention as of the filing date. *See* Capon v. Eshhar, 418 F.3d 1349, 1357 (Fed. Cir. 2005) (noting that the written description requirement "serves both to satisfy the inventor's obligation to disclose the technologic knowledge upon which the patent is based, and to demonstrate that the patentee was in possession of

discloses prophetic examples and no more, there is a real danger that the claimed embodiments cannot be made or that the invention will not work.[54] This, in turn, may frustrate the efforts of other researchers who seek to actually create the prophetically claimed invention or to improve upon it.[55]

In the end, a disclosure regime which does not require actual experimentation all too often produces patent documents which have little, if any, technical value. And, as discussed below, patents are often filled with repetitive, incomprehensible language, which further explains why many innovators avoid reading the patent literature altogether.

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the invention that is claimed"); Vas-Cath Inc. v. Mahurkar, 935 F.2d 1555, 1563–64 (Fed. Cir. 1991) (explaining that the written description must convey with "reasonable clarity" to the PHOSITA that the applicant possessed the claimed invention as of the filing date sought). An actual reduction to practice is one way to show possession. *See* Guidelines for Examination of Patent Applications Under the 35 U.S.C. 112, ¶ 1, "Written Description" Requirement, 66 Fed. Reg. 1099, 1105 (Jan. 5, 2001); *see also* Lockwood v. Am. Airlines, Inc., 107 F.3d 1565, 1572 (Fed. Cir. 1997) (listing additional ways to show possession). As with enablement, compliance with the written description requirement does not turn on the use of prophetic examples. *See, e.g.*, Ariad Pharms., Inc. v. Eli Lilly & Co., 560 F.3d 1366, 1375 (Fed. Cir. 2009) ("Prophetic examples are routinely used in the chemical arts, and they certainly can be sufficient to satisfy the written description requirement."), *vacated*, 2009 WL 2573004 (Fed. Cir. Aug. 21, 2009).

54 According to the Federal Circuit, claims are not necessarily invalid if they encompass inoperative embodiments because "'[i]t is not a function of the claims to specifically exclude . . . possible inoperative substances.'" *Atlas Powder*, 750 F.2d at 1576 (quoting *In re* Dinh-Nguyen, 492 F.2d 856, 858–59 (C.C.P.A. 1974)). But, "if the number of inoperative [embodiments] becomes significant, and in effect forces [a PHOSITA] to experiment unduly in order to practice the claimed invention, the claims might indeed be invalid." *Id.* at 1576–77; *see also* Durel Corp. v. Osram Sylvania Inc., 256 F.3d 1298, 1306–07 (Fed. Cir. 2001) (determining that if the accused infringer shows that a "significant percentage" of embodiments encompassed by the claims are inoperable, that might be sufficient to prove invalidity).

55 Harkins, *supra* note 42, at 453; Holbrook, *supra* note 28, at 158. To make matters worse, the prophetic examples themselves can be asserted as prior art against future inventors. *See* Amgen Inc. v. Hoechst Marion Roussel, Inc., 314 F.3d 1313, 1355 (Fed. Cir. 2003) ("In patent prosecution the examiner is entitled to reject application claims as anticipated by a prior art patent without conducting an inquiry into whether or not [the subject matter disclosed in the] patent is enabled . . . ."); Seymore, *supra* note 29, at 145; *see also* discussion *infra* Part III.A (discussing the drawbacks of undue patent scope on ex post improvement activity).

B. "Patentese"

1. What Is It?

Patent drafting is an art.[56] After working with the inventor to figure out what the invention is, the patent application drafter faces the formidable task of putting the invention into words.[57] Aside from crafting claims that will be easily infringed,[58] the drafter must craft a written description[59] that will enable and inform the meaning of the claim scope sought.[60] A crucial step in this process is transforming the inventor's plain English into patentese, the specialized language

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56 *See, e.g.*, Brenner v. Manson, 383 U.S. 519, 534 (1966) (referring to drafting as a "highly developed art"). Only registered patent attorneys and agents may draft patent applications. *See* Changes to Representation of Others Before the United States Patent and Trademark Office, 73 Fed. Reg. 47,650 (Aug. 14, 2008) (to be codified at 37 C.F.R. pt. 11).

57 The Supreme Court has recognized the difficulty of transforming an invention into words:

> "An invention exists most importantly as a tangible structure or a series of drawings. A verbal portrayal is usually an afterthought written to satisfy the requirements of patent law. This conversion of machine to words allows for unintended idea gaps which cannot be satisfactorily filled. Often the invention is novel and words do not exist to describe it. . . . Things are not made for the sake of words, but words for things."

Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 731 (2002) (quoting Autogiro Co. of Am. v. United States, 384 F.2d 391, 397 (Ct. Cl. 1967)).

58 Claims are of little value unless they can ensnare or deter a potential infringer. Patentees achieve this goal by obtaining broad claims which cover "all expected and unanticipated [variants] that competitors and others may later develop and all intentional and unintentional copies of the claimed invention which embody the inventor's concept." ROBERT C. FABER, LANDIS ON MECHANICS OF PATENT CLAIM DRAFTING § 10:1.1 (5th ed. 2006). Thus, the claims must cover not only competing products envisioned at the time of filing, but also competing products that the patentee could barely imagine which employ the concept of the invention. *See id.*; George F. Wheeler, *Creative Claim Drafting: Claim Drafting Strategies, Specification Preparation, and Prosecution Tactics*, 3 J. MARSHALL REV. INTELL. PROP. L. 34, 38–40 (2003).

59 The written description is the part of the patent (or patent application) that completely describes the invention. *See* 35 U.S.C. § 112 (2006) ("The specification shall contain a written description. . . . It shall conclude with one or more claims . . . ."). Although I will not do so in this Article, it is worth noting that the terms "written description" and "specification" are often used interchangeably (and mistakenly) in patent law. DONALD S. CHISUM ET AL., PRINCIPLES OF PATENT LAW 156 n.4 (3d ed. 2004).

60 It is a bedrock principle of patent law that claims are construed in light of the written description. *See* Seymour v. Osborne, 78 U.S. (11 Wall.) 516, 547 (1870); Markman v. Westview Instruments, Inc., 52 F.3d 967, 979–81 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370 (1996).

that patents are written in.[61] This transformation, whether deliberately or not,[62] leads many applicants to fall short of fulfilling the statutory mandate to provide a written description using "full, clear, concise, and exact terms."[63] For example, on an occasion when the late Judge Giles S. Rich had to parse through a chemical patent application, he explained that the patentese-laden phrase "an alcohol having at least one hydrogen atom attached to the carbon atom bearing the hydroxyl substituent to the corresponding carbonyl compound" meant, in plain English, "a primary or secondary alcohol."[64]

2. Why Is It Used?

First, patentese stretches the disclosure. In crafting the written description of the invention, the drafter must provide enough information to adequately enable the claims, which cannot be any broader than the disclosure.[65] The test is whether the enablement provided in the disclosure is commensurate in scope with the protection sought by the claims.[66] And, consistent with the doctrine of constructive reduc-

61 Although patentese often appears throughout the patent document, this Article focuses on its use in the written description.

62 *See* Brenner v. Manson, 383 U.S. 519, 534 (1966) (explaining that the patentee has an incentive to withhold information, which can be achieved through "the highly developed art of drafting patent [documents] so that they disclose as little useful information as possible."); WILLIAM D. NORDHAUS, INVENTION, GROWTH, AND WELFARE 89 (1969) ("It is well known that a firm tries not to disclose key parts of the invention in order to reduce the chance of imitation, thereby reducing the effective diffusion of knowledge."); *see also* Rebecca S. Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, 56 U. CHI. L. REV. 1017, 1029 & n.52 (1989) (suggesting that many published patents are of little use to others as a result of information suppression); Robin Feldman, *Plain Language Patents*, 17 TEX. INTELL. PROP. L.J. 289, 291–92 (2009) ("Jargon is also the perfect vehicle for strategic behavior. It allows legal actors to use broad open-ended language and then argue later that whatever position they wish surely falls within the language chosen.").

63 *See* 35 U.S.C. § 112 (2006).

64 *In re* Sarett, 327 F.2d 1005, 1006 (C.C.P.A. 1964).

65 O'Reilly v. Morse, 56 U.S. (15 How.) 62, 113 (1854); Nat'l Recovery Techs., Inc. v. Magnetic Separation Sys., Inc., 166 F.3d 1190, 1196 (Fed. Cir. 1999); *see also In re* Hyatt, 708 F.2d 712, 714 (Fed. Cir. 1983) (emphasizing that § 112 requires that "the enabling disclosure . . . be commensurate in scope with the claim under consideration").

66 *See In re* Moore, 439 F.2d 1232, 1236 (C.C.P.A. 1971) (referring to this test as the relevant enablement inquiry); cases cited *supra* note 65. The scope of enablement is the sum of what is taught in the written description plus what is known by a PHOSITA without undue experimentation. *Nat'l Recovery Techs.*, 166 F.3d at 1196. As I discuss below, one result of the proposal might be a shift toward narrower claiming. In other words, there will likely be a closer correspondence between the disclosed embodiments and the claim scope sought. For example, applicants in the chemical

tion to practice, courts allow the patentee to provide enablement either through illustrative examples or broad terminology.[67] An excerpt from a recently issued patent provides an example of the latter:

> Further aspects of the invention will become apparent from consideration of the drawings and the ensuing description of preferred embodiments of the invention. A person skilled in the art will realize that other embodiments of the invention are possible and that the details of the invention can be modified in a number of respects, all without departing from the inventive concept. Thus, the following drawings and description are to be regarded as illustrative in nature and not restrictive.[68]

In sum, an inventor who does very little can employ boilerplate patentese to help cast the invention in broad terms.

Second, and relatedly, patentese preserves claim scope. It allows the patentee to avoid poor word choices, which can disavow subject matter that otherwise would fall within the scope of the claims.[69] Perhaps in an effort to elucidate the inventor's true intention, the Federal Circuit has identified several linguistic pitfalls that the patentee must evade in order to avoid a narrow claim construction.[70] These pitfalls include language which explicitly or implicitly identifies essential aspects of the invention,[71] imperatively describes the invention

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arts will be less inclined to draft claims encompassing millions or billions of compounds because it is unlikely that the disclosure will include enough working examples to enable claims of that breadth. *See* Seymore, *supra* note 40, at 292.

67 *See In re* Wright, 999 F.2d 1557, 1561 (Fed. Cir. 1993).

68 U.S. Patent No. 7,249,538 col. 2 ll. 62–70 (filed Aug. 16, 2005).

69 *See* Watts v. XL Sys., Inc., 232 F.3d 877, 882 (Fed. Cir. 2000) (explaining that one purpose of examining the written description is to determine if the patentee has limited the scope of the claims). In addition, patentees must be mindful of the disclosure-dedication rule. *See* discussion *infra* Part III.C.

70 *See, e.g.*, Phillips v. AWH Corp., 415 F.3d 1303, 1316 (Fed. Cir. 2005) (en banc) (describing instances where the court interprets a claim more narrowly than it otherwise would to give effect to the inventor's intent to disavow a broader claim scope).

71 *See, e.g.*, Vehicular Techs. Corp. v. Titan Wheel Int'l, Inc., 212 F.3d 1377, 1380–82 (Fed. Cir. 2000) (affirming summary judgment of noninfringement); Tronzo v. Biomet, Inc., 156 F.3d 1154, 1159 (Fed. Cir. 1998) (determining that a written description which recited that "[an] extremely important aspect of the present device resides in the configuration of the acetabular cup as a trapezoid or a portion of a truncated cone" only supported conical shaped cups and not the broad cup shape recited in the claims) (quoting U.S. Patent No. 4,681,589 col. 3 1. 63 (filed June 1, 1984)); Vehicular Techs. Corp. v. Titan Wheel Int'l, Inc., 141 F.3d 1084, 1090–91 (Fed. Cir. 1998) (holding that if the written description clearly emphasizes the importance of a specific function, and the accused device is incapable of performing that function, then there can be no infringement); Gentry Gallery, Inc. v.

with so-called "patent profanity,"[72] distinguishes the invention from the prior art,[73] or discusses the exact problem that the invention solves.[74] Even an overly concise title for the patent can cause problems.[75] Thus, patentees inundate every facet of the patent document with patentese to avoid these pitfalls.[76]

Berkline Corp., 134 F.3d 1473, 1479 (Fed. Cir. 1998) (determining that a written description indicating the central location of controls and lacking any variation of their position implicitly indicated that the central location was essential).

72 Specific examples include words like "critical," "superior," "preferably," "must," "important," "peculiar," and "significant." *See* Bayer AG v. Elan Pharm. Research Corp., 212 F.3d 1241, 1252–54 (Fed. Cir. 2000) (collecting cases and providing examples of words that serve as a clear and unmistakable surrender of subject matter). For a detailed exploration of "patent profanity," see Allen R. Jensen & Stacy D. Lewis, *Patent Profanity: Watch Your Mouth!*, PAT. WORLD, Feb. 2002.

73 *See, e.g.*, Inpro II Licensing, S.A.R.L. v. T-Mobile USA, Inc., 450 F.3d 1350, 1356–57 (Fed. Cir. 2006) (affirming the district court's narrow construction of the term "host interface" in a claim directed to a PDA device); Astrazeneca AB v. Mutual Pharm. Co., 384 F.3d 1333, 1340 (Fed. Cir. 2004) (explaining that when the written description describes a feature of the invention and criticizes other products that lack that same feature, this operates as a clear disavowal of the other products and processes using these products); SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc., 242 F.3d 1337, 1344–45 (Fed. Cir. 2001) (affirming a district court's narrow claim construction because the written description specifically identified and criticized the prior art device, thereby disclaiming the subject matter); Ekchian v. Home Depot, Inc., 104 F.3d 1299, 1304 (Fed. Cir. 1997) (noting that characterizing the invention over the prior art often, by implication, indicates what the claims do not cover and, therefore, surrenders protection).

74 *See, e.g.*, J & M Corp. v. Harley-Davidson, Inc., 269 F.3d 1360, 1362–68 (Fed. Cir. 2001) (determining that patentee's statements in the written description that the claimed invention avoided problems of the prior art served as a disclaimer of subject matter).

75 On one hand, the patent rules say that the title of the invention "must be as short and specific as possible." 37 C.F.R. § 1.72 (2009). Nonetheless, in *Exxon Chemical Patents, Inc. v. Lubrizol Corp.*, 64 F.3d 1553 (Fed. Cir. 1995), the Federal Circuit used the patent's title, "Lubricating Oil Compositions *Containing* Ashless Dispersant, [ZDDP], Metal Detergent and a Copper Compound," to support its holding that the claim should cover a specific product with particularly defined ingredients. *See id.* at 1557–58. A few years later, Chief Judge Michel attempted, at great lengths, to confine *Exxon* to its facts. *See* Pitney Bowes, Inc. v. Hewlett-Packard Co., 182 F.3d 1298, 1312–13 (Fed. Cir. 1999). Not surprisingly, the patent bar remains cautious. *See* 1 IRAH H. DONNER, PATENT PROSECUTION § 1.V (5th ed. 2007).

76 *See The Disclosure Function of the Patent System*, *supra* note 17, at 2014–28. Notwithstanding the disclosure requirements of § 112, many patentees adopt the view that the written description does not define the invention but rather provides examples or embodiments of the invention. For instance, rather than using language which explicitly describes what "the invention" is, a savvy drafter would say something like: "In an embodiment, one aspect of the invention relates to . . . ." *See* Wheeler, *supra* note 58, at 43.

Third, patentese is, at least in part, an artifact of peripheral claiming. Until the Patent Act of 1870,[77] the U.S. patent system followed a central claiming regime in which the specific examples given in the written description served as the principal measure of claim scope.[78] Under the peripheral system, claim language sets forth the metes and bounds of the invention, like a deed to real property.[79] Thus, language now lies at the top of the hierarchy for determining claim scope. As a result, patentees have "develop[ed] various claim drafting schemes so as to maximize the breadth of a claim based on certain illustrative, or sometimes a modicum of, disclosure provided in the [written description]."[80] Professor Carl Moy explained that the inherent indeterminacy of language compounds this problem:

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77 Ch. 230, § 26, 16 Stat. 198, 201 (codified as amended at 35 U.S.C. § 171 (2006))

78 In central claiming, there is a close correlation between the working embodiments disclosed and the embodiments that are claimed. *See* Alan L. Durham, *Patent Symmetry*, 87 B.U. L. Rev. 969, 982 (2007); C. Leon Kim, *Transition from Central to Peripheral Definition Patent Claim Interpretation System in Korea*, 77 J. Pat. & Trademark Off. Soc'y 401, 402–03 (1995) (describing the central claiming regime); Toshiko Takenaka, *Doctrine of Equivalents After* Hilton Davis*: A Comparative Law Analysis*, 22 Rutgers Computer & Tech. L.J. 479, 503 (1996) (noting that under the central claiming regime, the claim merely identified examples of the invention). So, in contrast to peripheral claiming, central claiming "requires that the scope of the patent protection be determined by defining the principle forming the inventive idea or solution underlying the claim language." 17 Toshiko Takenaka, Interpreting Patent Claims: The United States, Germany and Japan 3 (1995). When the patent is enforced, the "[c]ourts use the wording of the claims as a guideline to determine the scope of protection, but are not strictly bound by claim limitations." *Id.*

79 The 1870 Act introduced the requirement to "particularly point out and distinctly claim the part . . . which [the applicant] claims." Patent Act of 1870 § 26, 16 Stat. at 201; *see also* Corning Glass Works v. Sumitomo Elec. U.S.A., Inc., 868 F.2d 1251, 1257 (Fed. Cir. 1989) (explaining that the claim provides the metes and bounds of the patentee's right to exclude). For an in-depth discussion of the transition from central to peripheral claiming, see *Ex Parte* Fressola, 27 U.S.P.Q.2d 1608, 1609–11 (B.P.A.I. 1993).

80 Kim, *supra* note 78, at 404; *see also* Dan L. Burk & Mark A. Lemley, *Quantum Patent Mechanics*, 9 Lewis & Clark L. Rev. 29, 53–54 (2005) (discussing the shortcomings of peripheral claiming); Clarisa Long, *Information Costs in Patent and Copyright*, 90 Va. L. Rev. 465, 542 & n.187 (2004) (recognizing that applicants deliberately build ambiguity into the patent document); Douglas R. Nemec & Emily J. Zelenock, *Rethinking the Role of the Written Description Requirement in Claim Construction: Whatever Happened to "Possession is Nine-Tenths of the Law?,"* 8 Minn. J. L. Sci. & Tech. 357, 406 (2007) (contending that in spite of the statutory mandate that a patentee's exclusive rights extend only to the clearly described subject matter of his claim, "current claim construction practice allows the patentee to unfairly benefit from incomplete, unclear, and imprecise descriptions of its own invention since such descriptions are less likely to be construed to represent unequivocal narrowing language").

> Peripheral claiming equates the scope of the patent right with the lingual meaning of the words in the patent claim. It does not include any direct reference to the scope of the patent disclosure. Accordingly, peripheral claiming provides the patentee with a much more powerful means of defining the invention . . . . In addition, peripheral claiming imposes no inherent limit on the level of abstraction that the patentee is able to use in the claim.[81]

Given this incentive, and recognizing that the courts will not invalidate claims for indefiniteness unless they are "insolubly ambiguous,"[82] patentees intentionally draft ambiguous claims in an effort to expand their patent rights as far as possible.[83]

3. Drawbacks

While applicants view patentese as an invaluable tool for protecting claim scope, it has drawbacks. First, patentese obscures the invention. An interested reader must parse through the broad terminology

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81 R. Carl Moy, *Subjecting Rembrandt to the Rule of Law: Rule-Based Solutions for Determining the Patentability of Business Methods*, 28 WM. MITCHELL L. REV. 1047, 1082 (2002) (internal citations omitted); *cf.* Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 731 (2002) ("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 and disclose it to the public, rather than exploit it in secret, bears the risk that others will devote their efforts toward exploiting the limits of the patent's language . . . .").

82 *See* Exxon Research & Eng'g Co. v. United States, 265 F.3d 1371, 1375 (Fed. Cir. 2001). Several commentators have criticized this weak standard. *See* Michael J. Meurer & Craig Allen Nard, *Invention, Refinement and Patent Claim Scope: A New Perspective on the Doctrine of Equivalents*, 93 GEO. L.J. 1947, 1975–78 (2005) (exploring drafting strategies that preserve claim scope); Samson Vermont, *Taming the Doctrine of Equivalents in Light of* Patent Failure, 16 J. INTELL. PROP. L. 83, 85 (2008) (arguing that the standard should be changed to "something along the lines of 'not particular and distinct.'" (quoting Honeywell Int'l, Inc. v. Int'l Trade Comm'n, 341 F.3d 1332, 1340 (Fed. Cir. 2003)).

83 *See The Disclosure Function of the Patent System*, *supra* note 17, at 2025–26. As a normative matter, this claiming practice runs afoul of the definiteness requirement of § 112, whose primary purpose is to provide notice to others and "to guard against unreasonable advantages to the patentee and disadvantages to others arising from uncertainty as to their [respective] rights." Gen. Elec. Co. v. Wabash Appliance Corp., 304 U.S. 364, 369 (1938). If the ambiguous claim has at least two reasonable meanings, the court may choose to adopt a narrow meaning, which is unfavorable to the patentee. *See* Athletic Alternatives, Inc. v. Prince Mfg., Inc., 73 F.3d 1573, 1581 (Fed. Cir. 1996). If the language is unintelligible, the court may invalidate the claim under § 112. *See* Craig Allen Nard, *A Theory of Claim Interpretation*, 14 HARV. J.L. & TECH. 1, 81 (2000) (citing *Athletic Alternatives*, 73 F.3d at 1583 (Nies, J., concurring)). But "[n]o matter the choice, the result is a sanction against the patentee, and, hopefully, a deterrent against poor claim drafting." *Id.*

and jargon to figure out both what the inventor actually did and intended to encompass by the claims. From a teaching standpoint, someone who wants to understand the invention must hope that the inventor discloses the information through another source, like a technical journal.[84]

Second, patentees use patentese to sidestep enablement. Since the courts allow the patentee to provide enablement with "broad terminology,"[85] an inventor has little incentive to actually reduce an invention to practice before filing a patent application. In addition, any doubts about enablement are resolved in the patentee's favor, both in patent prosecution[86] and litigation.[87] As a result, some patentees deliberately suppress crucial information or purposely craft documents that are hard to understand.[88]

Third, patentese creates problems in the courtroom.[89] Many judges dread patent cases.[90] Litigators contend that patent jury ver-

84 *See* Holbrook, *supra* note 28, at 146 (explaining that patents may even encourage disclosure through pre-patent disclosures and publications).

85 *See In re* Wright, 999 F.2d 1557, 1561 (Fed. Cir. 1993).

86 During prosecution, the examiner must prove nonenablement because the disclosure is presumed sufficient. *In re* Marzocchi, 439 F.2d 220, 224 (C.C.P.A. 1971) ("[I]t is incumbent upon the Patent Office, whenever [an enablement] rejection . . . is made, to explain *why* it doubts the truth or accuracy of any statement in a supporting disclosure and to back up assertions of its own with acceptable evidence or reasoning which is inconsistent with the contested statement."); *see also In re* Budnick, 537 F.2d 535, 537 (C.C.P.A. 1976) ("Where an applicant asserts that a specification [is enabled] . . . but the examiner is of the opinion that the disclosure is nonenabling, he has the burden of substantiating his doubts concerning enablement with reasons or evidence.").

87 Since an issued patent is presumed valid, *see* 35 U.S.C. § 282 (2006), the challenger must prove nonenablement by clear and convincing evidence. *See* Morton Int'l, Inc. v. Cardinal Chem. Co., 5 F.3d 1464, 1470 (Fed. Cir. 1993). In addition, the presumption of validity remains intact and the burden of proof remains on the challenger throughout the litigation, and the clear and convincing standard does not change. *See* Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1375 (Fed. Cir. 1986).

88 *See supra* note 62.

89 As the late Chief Judge Helen Nies once pointed out, "We have made the infringement analysis so convoluted [that] it is impossible for most district court judges untrained in 'patentese' to follow, much less jurors." Hilton Davis Chem. Co. v. Warner-Jenkinson Co., 62 F.3d 1512, 1563 (Fed. Cir. 1995) (Nies, J., dissenting), *rev'd sub nom.* Warner-Jenkinson Co. v. Hilton Davis Chem. Co., 520 U.S. 17 (1997). For a trial judge's perspective, see Rexnord, Inc. v. Laitram Corp., 628 F. Supp. 467, 473 (E.D. Wis. 1986) (admitting that while the court has expertise in discovering truth based on the actions of litigants, "its expertise in ascertaining truth from technical patent documents is not as glowing").

90 *See A Panel Discussion: Claim Construction from the Perspective of the District Judge*, 54 CASE W. RES. L. REV. 671, 682 (2004) ("I have heard trial judges claim that they dislike

dicts are unpredictable because jurors find the cases too hard to understand.[91] Although several commentators suggest that the bane of patent litigation for both judges and jurors is the technical nature of the *subject matter*,[92] the heart of the problem might actually be patentese. As a judge once explained:

> Judges trained in the law are confronted with baffling devices applying esoteric principles of all branches of higher mathematics and science. . . . [T]he patent bar, with its generally high state of professional competence and extraordinary thoroughness in preparation, has found helpful ways to make the judges' task manageable and intelligible. . . . [But] to the problem of understanding the substantive nature of the patented device or method may be added the further, if not more basic, one of communication: just what do these words—often a long, prolix combination . . . mean?[93]

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patent litigation, partly because it is hard. Patent litigation is like the neurosurgery of litigation: it is hard scientifically and it is hard legally.") (statement of Judge Patti Saris); Janice M. Mueller, *Crafting Patents For The Twenty-First Century: Maximize Patent Strength and Avoid Prosecution History Estoppel in a Post-*Markman */*Hilton Davis *World*, 79 J. PAT. & TRADEMARK OFF. SOC'Y 499, 503 (1997) (presenting several reasons for the judicial dislike of patent cases); *Edited & Excerpted Transcript of the Symposium on Ideas Into Action: Implementing Reform of the Patent System*, 19 BERKELEY TECH. L.J. 1053, 1108–09 (2004) (statement of Lynn Pasahow) (describing how some judges hate to hear patent cases and try to devote as little time to them as possible).

91 *See, e.g.*, ADVISORY COMM'N ON PATENT LAW REFORM, A REPORT TO THE SECRETARY OF COMMERCE 107–10 (1992) (exploring arguments for and against jury trials in patent cases); Kimberly A. Moore, *Jury Demands: Who's Asking?*, 17 BERKELEY TECH. L.J. 847, 852 (2002) ("If juries are unable to understand the technology or apply the law, their decisions will be based on less meritorious influences such as bias, likeability, or emotion."); Philippe Signore, *On the Role of Juries in Patent Litigation (*Part 1*)*, 83 J. PAT. & TRADEMARK OFF. SOC'Y 791, 824–29 (2001) (discussing juror competence in patent cases). For a trial judge's perspective, see *Judicial Panel Discussion on Science and the Law*, 25 CONN. L. REV. 1127, 1145 (1993) ("Honest to God, I don't see how you could try a patent matter to a jury. Goodness, I've gotten involved in a few of these things. It's like somebody hit you between your eyes with a four-by-four. It's factually so complicated." (statement of Judge Alfred V. Covello)).

92 *See generally* Jack E. Brown, *The Advantages and Disadvantages of Juries in Technical Cases*, 9 SANTA CLARA COMPUTER & HIGH TECH. L.J. 403 (1993) (arguing that juries are capable of handling complex, technical cases, and suggesting procedural improvements); Kimberly A. Moore, *Judges, Juries, and Patent Cases—An Empirical Peek Inside the Black Box*, 99 MICH. L. REV. 365 (2000) (using empirical data to assess the relative competitiveness of judges and juries in patent cases); Arti K. Rai, *Specialized Trial Courts: Concentrating Expertise on Fact*, 17 BERKELEY TECH. L.J. 877 (2002) (advocating for the creation of a patent trial court).

93 Thermo King Corp. v. White's Trucking Serv., Inc., 292 F.2d 668, 675 (5th Cir. 1961). Although the judge was commenting on claim language, his remarks are also applicable to the language in the written description.

Stripping away the patentese would allow the judge to see the legal issues involved and help the factfinder better understand the technology.[94]

II. Improving the Teaching Function of Patents

A. Imposing a Working Example Requirement

1. Raising the Standard of Disclosure

It is axiomatic that the best way to teach a technical subject is with real examples.[95] This is why working examples and descriptions of work actually performed pervade science journals and other forms of technical literature.[96] If patents are to compete with these information sources, then they must provide the same quality of teaching. For this to happen, two things must occur. First, at least for complex inventions, an actual reduction to practice must become the standard of disclosure. In brief, this would require that an inventor prove, through adequate detail in the written description, that the claimed invention has been constructed and works for its intended purpose.[97] Second, applicants must be allowed to fulfill the statutory mandate of drafting the written description using "full, clear, concise, and exact terms" without the fear of a potentially narrow claim construction.[98]

Adopting these changes would establish a regime in which applicants seeking a patent for a complex invention could no longer rely on broad terminology or prophetic examples to satisfy enablement because the scope of the claim would be inherently limited by the working examples provided.[99] Put more simply, working examples would supersede language in fixing claim scope.[100] Yet, in litigation, the patentee could rely on the doctrine of equivalents[101] to obtain

94 *Cf.* Aghnides v. F. W. Woolworth Co., 335 F. Supp. 370, 379 (D.C. Md. 1971) ("[I]t is . . . beneficial in patent cases to strip away the shroud of jargon . . . in order to see the legal issues involved."), *aff'd mem.*, 475 F.2d 1399 (4th Cir. 1973).

95 *See, e.g.*, George Gore, *On Practical Scientific Instruction*, 7 Q. J. Sci. 215, 228 (1870) (asserting that one who teaches a technical subject must teach with examples which should be full of practical applications and familiar illustrations).

96 *See generally* Vernon Booth, Communicating in Science (2d ed. 1993) (communicating the importance of science writing); Robert A. Day & Barbara Gastel, How to Write and Publish a Scientific Paper (6th ed. 2006) (same).

97 Mazzari v. Rogan, 323 F.3d 1000, 1005 (Fed. Cir. 2003) (citing Cooper v. Goldfarb, 154 F.3d 1321, 1327 (Fed. Cir. 1998)).

98 *See* 35 U.S.C. § 112 (2006); discussion *supra* Part I.B.2.

99 *See* Moy, *supra* note 81, at 1081.

100 *See* discussion *supra* Part I.B.2 (discussing the current disclosure regime).

101 A patent holder can prove infringement in either of two ways: by demonstrating that every element of a claim (1) is literally infringed or (2) is infringed under the

coverage for variations beyond those specifically described in the written description that embody the inventive idea.[102] By eliminating the need or incentive for patentese, opaque language would quickly disappear from the written description. The end result would be a readable and substantively useful patent document.

2. A New Examination Protocol

As an initial matter, the examiner should have the authority to request working examples. This would be akin to, but different from, the Patent Office's ability (albeit rarely used) to request a working model of an invention.[103] The examiner would make this request if it appears that the written description as filed provides inadequate teaching to enable a PHOSITA to understand and carry out the full

judicially created doctrine of equivalents (DOE). Literal infringement requires that the accused product or process falls precisely within the terms of the asserted patent claim. *See* Engel Indus., Inc. v. Lockformer Co., 96 F.3d 1398, 1405 (Fed. Cir. 1996). The DOE recognizes that in order to adequately protect a patentee, sometimes it is appropriate to extend the right to exclude beyond the literal boundaries of the claim. *See* Graver Tank & Mfg. Co. v. Linde Air Prods. Co., 339 U.S. 605, 609 (1950). Thus, the DOE allows a patentee "to claim those insubstantial alterations that were not captured in drafting the original patent claim but which could be created through trivial changes." Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 733 (2002).

102 The DOE emerged under the central claiming regime. *See* Winans v. Denmead, 56 U.S. (15 How.) 330, 342 (1854) (explaining that a patentee intends to claim not only the precise embodiment disclosed, but other forms which embody the invention); TAKENAKA, *supra* note 78, at 9–10.

103 The patent statute permits the examiner to request a working *model* of an invention. *See* 35 U.S.C. § 114 (2006) ("The Director may require the applicant to furnish a model of convenient size to exhibit advantageously the several parts of his invention."). In cases where the invention involves a composition of matter, the Director "may require the applicant to furnish specimens or ingredients for the purpose of inspection or experiment." *Id.* Curiously, the Patent Act of 1836, ch. 356, § 6, 5 Stat. 117 (amended 1839), required applicants to submit models at the time of filing. *See also In re* Breslow, 616 F.2d 516, 522 (C.C.P.A. 1980) (recounting the history of the requirement). The Patent Act of 1870 made the submission of models discretionary. *See* Patent Act of 1870 §§ 28–29, ch. 230, §§ 28–29, 16 Stat. 198; *In re* Breslow, 616 F.2d at 522. In practice, the examiner only requests a working model in extreme cases where an invention defies fundamental laws of science and inoperativeness is incredibly clear. *See* 37 C.F.R. § 1.91(b); MPEP, *supra* note 44, § 608.03. For specific examples, see generally Newman v. Quigg, 877 F.2d 1575 (Fed. Cir. 1989) (perpetual motion machine); Patently-O, http://patentlyo.com/patent/2006/02/pto_requests_mo.html (Feb. 19, 2006, 05:58 CST) (discussing the file history for the Worsley-Twist warp drive, U.S. Patent No. 182,373 (filed Oct. 25, 2002) (abandoned Jul. 20, 2006)). Although this proposal does not go as far as § 114, it is similar in that it too requires an actual reduction to practice. More importantly, a working example requirement probably falls within the Patent Office's statutory authority.

scope of the claimed invention without undue experimentation.[104] In response, under the new protocol, the applicant could amend the written description to include working examples.[105] Upon receiving the amendment, the examiner would determine "whether the material added by [the] amendment was inherently contained in the original application."[106] If so, the examiner would enter the amendment and proceed with prosecution.[107]

On the other hand, the applicant could determine that it is too difficult or impossible to actually reduce all or parts of the invention to practice. If this happens, the applicant could voluntarily decide to either make a narrowing claim amendment or to abandon the application altogether.[108]

Even if real examples provide the best form of teaching, the new examination protocol would recognize that an applicant needs to provide them only when the invention's nature or complexity so

104 *Cf.* Genentech, Inc. v. Novo Nordisk, A/S, 108 F.3d 1361, 1366 (Fed. Cir. 1997) ("[R]easonable detail must be provided in order to enable members of the public to understand and carry out the invention."); discussion *infra* Part II.B.

105 This would, of course, require the Federal Circuit and the Patent Office to adopt a more flexible view of what constitutes "new matter." To elaborate, when an applicant amends the written description, the Patent Office instructs examiners to be on the alert for "new matter." *See* 35 U.S.C. § 132(a) (2006) ("No amendment shall introduce new matter into the disclosure of the invention."); 37 C.F.R. § 1.121; MPEP, *supra* note 44, § 706.03(o) (alerting examiners). The new matter prohibition of 35 U.S.C. § 132 and its corollary, the written description requirement of 35 U.S.C. § 112, "both serve to ensure that the patent applicant was in full possession of the claimed subject matter on the application filing date." TurboCare Div. of Demag Delaval Turbomachinery Corp. v. Gen. Elec. Co., 264 F.3d 1111, 1118 (Fed. Cir. 2001).

106 Schering Corp. v. Amgen Inc., 222 F.3d 1347, 1352 (Fed. Cir. 2000); *accord TurboCare*, 264 F.3d at 1118. Exactly what constitutes new matter must be determined on a case-by-case basis. *In re* Oda, 443 F.2d 1200, 1203 (C.C.P.A. 1971).

107 One might ask if the amendment would unfairly give the applicant a "second bite at the apple" with respect to compliance with § 112. *See In re* Hogan, 559 F.2d 595, 604 (C.C.P.A. 1977) (explaining that compliance with enablement is gauged as of the applicant's effective filing date). Possibly, but as discussed in the main text, this examination protocol is designed to strike a balance between early disclosure and the need to transform the patent into a substantive technical document which can itself promote innovation. *See infra* Part III.A. If anything, allowing the amendment would yield claims that are certainly narrower than those that would likely issue under the current regime because the added working examples themselves will further constrain claim scope. *See* discussion *supra* Part II.A.1; *supra* note 42 and accompanying text.

108 This may ultimately lead to narrower claiming and, possibly, to patenting strategies which involve prosecuting smaller, discrete applications. *See* Seymore, *supra* note 40, at 290 (suggesting that a series of recent Federal Circuit enablement cases may induce this result).

demands. In other words, an actual reduction to practice would be unnecessary when doing so would be trivial, or the potential teaching or technical value would be slight. This is particularly true for simple, mechanical inventions rooted in well-defined, "predictable" factors.[109] A good example is a broom-rake.[110] Since a PHOSITA in the field of harvesting can typically predict the effectiveness of the tool based on the number of teeth and the gap between them,[111] a PHOSITA can likely make and use a broom-rake with a minimal amount of teaching.[112] Thus, the examiner probably would not request a working example. This result is entirely consistent with the teaching function: if an innovator in the field of harvesting were to turn to the patent literature at all, the substantive technical value of the disclosure probably would not depend on whether the rake was actually reduced to practice.

At the other end of the spectrum are inventions in the experimental sciences. In contrast to the mechanical arts, results in these fields are often unpredictable because researchers often must engage in trial and error to figure out what works and what does not.[113]

109 *See In re* Vaeck, 947 F.2d 488, 496 (Fed. Cir. 1991) (noting that the requisite level of disclosure for an invention involving a "predictable" factor such as a mechanical or electrical element is less than that required for the unpredictable arts).

110 *See* U.S. Patent No. 3,078,652 (filed Sept. 1, 1961).

111 *See generally* R. A. KEPNER ET AL., PRINCIPLES OF FARM MACHINERY (3d ed. 1978) (discussing agricultural machinery).

112 *Cf.* Slip Track Sys., Inc. v. Metal-Lite, Inc., 304 F.3d 1256, 1265 (Fed. Cir. 2002) (recognizing that proof that an invention works for its intended purpose is not required in certain cases because "'[s]ome devices are so simple and their purpose and efficacy so obvious that their complete construction is sufficient to demonstrate their workability'" (quoting E. Rotorcraft Corp. v. United States, 384 F.2d 429, 431 (Ct. Cl. 1967)).

113 *See* Karen S. Canady, *The* Wright *Enabling Disclosure for Biotechnology Patents*, 69 WASH. L. REV. 455, 458 (1994); *see also* Cedarapids, Inc. v. Nordberg, Inc., No. 95-1529, 1997 WL 452801 at *2 (Fed. Cir. Aug. 11, 1997) (explaining that in the chemical arts, "a slight variation . . . can yield an unpredictable result or may not work at all."); *In re* Prutton, 200 F.2d 706, 712 (C.C.P.A. 1952) (holding that claims to a class of chemical compounds, which were sufficiently broad to involve some speculation, lack enablement, notwithstanding the presence of the operative specific examples within the class); DAN L. BURK & MARK A. LEMLEY, THE PATENT CRISIS & HOW THE COURTS CAN SOLVE IT 115 (explaining that if the art is uncertain, "the court will be inclined to require greater disclosure to satisfy the requirements of § 112, and correspondingly narrow the scope of claims permissible for any given disclosure"). *But see* Enzo Biochem, Inc. v. Calgene, Inc., 188 F.3d 1362, 1374 n.10 (Fed. Cir. 1999) ("In view of the rapid advances in science, we recognize that what may be unpredictable at one point in time may become predictable at a later time."). Since enablement is closely tied to the PHOSITA's identity, this helps to explain why it is a shifting, unstable doctrine. *See* Holbrook, *supra* note 28, at 176.

Given that a PHOSITA usually cannot predict experimental outcomes with any reasonable likelihood of success, there is a danger that embodiments not actually reduced to practice either cannot be made, will not work for their intended purpose, or will require a PHOSITA to engage in unduly extensive experimentation to figure out how to practice the invention.[114] Even the courts have recognized that working examples are most helpful for inventions at this end of the spectrum because it is in these fields where the PHOSITA often "has little or no knowledge independent from the patentee's instruction."[115] And with respect to teaching, innovators in unpredictable fields (and particularly newer technologies) rely extensively on the technical literature; thus, they would certainly turn to another source if the relevant patent lacked working examples. That possibility, all too common under the current regime, is foreclosed by the proposal.

As a final illustration, consider the following hypothetical prosecution implementing the new examination protocol. The inventor files a patent application directed toward a new class of pharmaceutical compounds. The application includes a generic claim that, by claiming a core chemical structure with an array of twenty variables appended to it, encompasses billions of chemical compounds.[116] As is typical in chemical cases, the claim is incredibly broad[117]—here

114 *See* Seymore, *supra* note 29, at 138. *See generally* Herbert H. Goodman, *The Invalidation of Generic Claims by Inclusion of a Small Number of Inoperative Species*, 40 J. PAT. OFF. SOC'Y 745 (1958) (outlining several problems which arise in drafting chemical claims involving inductive reasoning from limited examples).

115 Chiron Corp. v. Genentech, Inc., 363 F.3d 1247, 1254 (Fed. Cir. 2004); *see also In re* Strahilevitz, 668 F.2d 1229, 1232 (C.C.P.A. 1982) (explaining that working examples are desirable in complex technologies).

116 *See In re* Driscoll, 562 F.2d 1245, 1249 (C.C.P.A. 1977) (explaining that the practice of describing a class of chemical compounds in terms of structural formulas, where the substituents are recited in the claim language, has been sanctioned by the courts). This style of claiming is called Markush practice. *See In re* Harnisch, 631 F.2d 716, 719–20 (C.C.P.A. 1980) (explaining the history and current law of Markush practice). For an example of this style of claiming, see U.S. Patent No. 4,801,613 (filed June 17, 1987) [hereinafter '613 patent]. Claim 1 of the '613 patent refers to "[a] modified bradykinin type peptide having the formula A-Arg-B-C-D-W-X-Y-Z-Arg," where the variables A, B, C, D, W, X, Y, Z are each generic substructures reciting smaller peptides or amino acids. Thus, the primary generic structure contains eight smaller generic substructures. *See id.* cols. 19–20, ll. 21–41. All together, this claim covers 10,235,904 formulations of a peptide. For an extreme example, see generally U.S. Patent No. 5,422,351 (filed June 21, 1991) (including a structural formula in claim 1 which encompasses at least one novemdecillion (which is ten followed by sixty zeroes) chemical compounds).

117 *See* BRADLEY C. WRIGHT, DRAFTING PATENTS FOR LITIGATION AND LICENSING 457 (2008) (advising drafters of chemical patent applications to provide adequate support for claims that often covers billions of species).

because one can substitute each of the twenty variables appended to the core structure with countless organic functional groups.[118] The written description, however, only sets forth five compounds actually reduced to practice. These working examples are closely related to each other in that the same variable (one of the twenty) was substituted in each. After construing the claims, assessing the level of skill in the art, and evaluating the teaching provided, the examiner determines that the disclosure only teaches a PHOSITA how to make five hundred compounds, not billions. Consequently, the examiner provisionally rejects the broad generic claim for nonenablement and asks the applicant to provide additional working examples to enable its full scope. In response, the applicant amends the written description to include an additional working example that substitutes one more variables on the core structure. In addition, the applicant voluntarily cancels the broad generic claim and prosecutes a narrower subgenus claim covering six hundred compounds. As a result, the applicant obtains a patent where the claim scope obtained is truly commensurate with the teaching provided in the written description.[119]

B. Drawing Support from History

An actual reduction to practice is no stranger to patent law.[120] It is a term of art which has been bandied about to resolve contests between two or more parties claiming the same invention,[121] to prove

118 A functional group is a group of atoms within a molecule that represents a potential reaction site in an organic compound. Functional groups determine a molecule's chemical reactivity. *See generally* RICHARD C. LAROCK, COMPREHENSIVE ORGANIC TRANSFORMATIONS (1999) (providing a systematic collection of synthetic transformations and reactions).

119 As stated above, in enforcing the patent, the patentee could rely on the doctrine of equivalents to obtain coverage for variations that embody the inventive concept, beyond those specifically described in the written description. *See supra* note 101 and accompanying text.

120 For a detailed history of the role of an actual reduction to practice in patent law, see generally 3A DONALD S. CHISUM, CHISUM ON PATENTS § 10.06 (2005); William C. Rooklidge & W. Gerard von Hoffmann, III, *Reduction to Practice, Experimental Use, and the "On Sale" and "Public Use" Bars to Patentability*, 63 ST. JOHN'S L. REV. 1 (1988).

121 Patent rights are only awarded to the first inventor. 35 U.S.C. § 102(g) (2006) (barring issuance of a patent when another inventor has made the invention before the applicant). When two parties claim the same invention, a Patent Office intraoffice tribunal, known as the Board of Patent Appeals and Interferences, institutes an "interference" proceeding to determine which party is entitled to a patent. 35 U.S.C. § 135 (2006). The party who was first to reduce the invention to practice usually wins; however, a party who was first to conceive the invention but last to reduce to practice will win if that party demonstrates reasonable diligence toward the reduction to practice. *See* Cooper v. Goldfarb, 154 F.3d 1321, 1327 (Fed. Cir. 1998). Although filing a

a date of invention to overcome prior art,[122] to determine if an invention is "ready for patenting" in determining the critical date for the on-sale and public use bars to patentability,[123] to show possession of the invention,[124] to prove operability,[125] and to gauge enablement.[126] With respect to the latter three, an actual reduction to practice is typically not required to comply with the statutory requirements.[127] Nonetheless, as discussed below, history reveals that the courts seem-

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U.S. patent application establishes a constructive reduction to practice, a party can obtain an earlier date by proving that the invention was actually reduced to practice before the filing date. *See* Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1376 (Fed. Cir. 1986).

122 *See, e.g.*, Mahurkar v. C.R. Bard, Inc., 79 F.3d 1572, 1578 (Fed. Cir. 1996) (holding that a catalog was not patent-defeating prior art because the invention was conceived and actually reduced to practice prior to the publication date of the catalog).

123 *See* Pfaff v. Wells Elecs., Inc., 525 U.S. 55, 66–68 (1998) (articulating the "ready for patenting" prong for determining when the 35 U.S.C. § 102(b) bar to patentability is triggered). If the invention was actually reduced to practice before being sold, offered for sale, or was in public use more than one year before filing of the application, a patent will be barred. *See* Invitrogen Corp. v. Biocrest Mfg., L.P., 424 F.3d 1374, 1379 (Fed. Cir. 2005); Vanmoor v. Wal-Mart Stores, Inc., 201 F.3d 1363, 1366–67 (Fed. Cir. 2000).

124 *See supra* note 53 (discussing possession).

125 The claimed invention must be "capable of being used to effect the object proposed." Mitchell v. Tilghman, 86 U.S. (19 Wall.) 287, 396 (1874). An invention which is inoperative fails to satisfy the utility requirement of 35 U.S.C. § 101 (2006). *See In re* Harwood, 390 F.2d 985, 989 (C.C.P.A. 1968).

126 *See infra* notes 128–39 and accompanying text.

127 *See* Falko-Gunter Falkner v. Inglis, 448 F.3d 1357, 1366–67 (Fed. Cir. 2006) (reiterating that an actual reduction to practice is not required). In the case of operability, the Federal Circuit has explained that the Patent Office "has the initial burden of challenging a presumptively correct assertion of utility in the disclosure." *In re* Brana, 51 F.3d 1560, 1566 (Fed. Cir. 1995). Likewise, a patent application is presumptively enabled at the time of filing. *See In re* Marzocchi, 439 F.2d 220, 223 (C.C.P.A. 1971). The *Pfaff* Court pointed to the patent for Alexander Graham Bell's telephone, which was upheld even though he filed the application before the invention was actually reduced to practice because "'[i]t is enough if he describes his method with sufficient clearness and precision to enable those skilled in the matter to understand what the process is, and if he points out some practicable way of putting it into operation.'" *Pfaff*, 525 U.S. at 62 (quoting The Telephone Cases, 126 U.S. 1, 536 (1888)). Arguably, other language in the 1888 opinion suggests that this enablement standard is best suited for inventions in the predictable arts. *See id.* ("'A good *mechanic* of proper skill in matters of the kind can take the patent and, by following the specification strictly, can, without more, *construct an apparatus* which, when used in the way pointed out, will do all that it is claimed the method or process will do . . . .'" (quoting *The Telephone Cases*, 126 U.S. at 536) (emphasis added)).

ingly prefer, and in some cases require, working examples for inventions in complex technologies.[128]

First, a few cases suggest that, in the early stages of development, inventions in unpredictable technologies require actual experimentation to satisfy enablement.[129] The case that best illustrates this proposition is *Genentech, Inc. v. Novo Nordisk, A/S*,[130] which addressed the sufficiency of disclosure in the rapidly advancing field of biotechnology.[131] The invention related to a method for producing a protein, human growth hormone (HGH), by using bacteria to first generate a larger protein and then cleaving off the undesired portion with a technique called cleavable fusion expression.[132] Rather than disclosing specific materials, reaction conditions, or working examples, the relevant portion of the written description merely described several sites on the larger protein for which cleavable fusion expression "is *generally* well-suited."[133] Genentech asserted that an enzymology textbook and knowledge in the art could fill in gaps omitted from the disclosure.[134]

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128 For a general discussion of the history and rationale for the unwritten rule of including examples in patent applications, see generally Bratislav Stankovic, *The Use of Examples in Patent Applications*, 18 INTELL. PROP. & TECH. L.J. 9 (2006).

129 *See, e.g.*, Chiron Corp. v. Genentech, Inc., 363 F.3d 1247 (Fed. Cir. 2004) (patent for monoclonal antibodies capable of fighting breast cancer); Genentech, Inc. v. Novo Nordisk, A/S, 108 F.3d 1361 (Fed. Cir. 1997) (patent for a cleavable fusion process for creating human growth hormone). Aside from any heightened disclosure standard that attaches with unpredictability, there may also be an underlying public policy rationale. *See, e.g.*, Canady, *supra* note 113, at 462 (describing the tension in balancing the need to grant broad claims to meaningfully reward valuable advances against the concern that granting broad claims will hinder further advances or disproportionately reward those who make small, but timely, contributions).

130 108 F.3d 1361 (Fed. Cir. 1997).

131 This field encompasses technologies related to modifying biological materials to benefit humankind. Inventions range from tailor-made drugs to biofuels, and cures for acquired and genetic diseases. Perhaps not surprisingly, the courts classify the field as "highly unpredictable." *See* Enzo Biochem, Inc. v. Calgene, Inc., 188 F.3d 1362, 1372 (Fed. Cir. 1999). For an interesting commentary on the Federal Circuit's jurisprudence in biotechnology cases, see Lawrence M. Sung, *Stranger in a Strange Land: Biotechnology and the Federal Circuit*, 2 WASH. U. J.L. & POL'Y 167 (2000).

132 *Genentech*, 108 F.3d at 1363.

133 *Id.* at 1365.

134 *See id.* Genentech relied, to its detriment, on the oft-cited statement that "a patent need not teach, and preferably omits, what is well known in the art." Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1384 (Fed. Cir. 1986); *see also* Liebel-Flarsheim Co. v. Medrad, Inc., 481 F.3d 1371, 1380 (Fed. Cir. 2007) (explaining that the written description need not necessarily describe how to make and use every embodiment of the invention because the PHOSITA's "'knowledge of the prior art and routine experimentation can often fill in the gaps'" (quoting AK

When faced with the question of whether the written description would have enabled a PHOSITA at the time of filing to use cleavable fusion expression to make HGH without undue experimentation,[135] the Federal Circuit determined that it did not:

> "[A] patent is not a hunting license. It is not a reward for the search, but compensation for its successful conclusion."[ ] Tossing out the mere germ of an idea does not constitute enabling disclosure. While every aspect of a [broad] claim certainly need not have been carried out by an inventor, or exemplified[,] . . . *reasonable detail must be provided* in order to enable members of the public to understand and carry out the invention. . . .
>
> . . . It is the [written description], not the knowledge of one skilled in the art, that must supply the novel aspects of an invention in order to constitute adequate enablement.[136]

The absence of any actual details, coupled with the fact that no one had been able to produce any human protein via cleavable fusion expression at the time of filing, led the court to easily conclude that a PHOSITA would require undue experimentation to obtain the claimed result.[137] Indeed, the speculative statement in the written description "provide[d] only a starting point, a direction for further research."[138] In sum, an enabling description for inventions of this type must provide the PHOSITA with "a specific and useful teaching."[139]

Second, when an applicant purports to invent something that is contrary to well-settled scientific principles, the lack of working exam-

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Steel Corp. v. Sollac, 344 F.3d 1234, 1244 (Fed. Cir. 2003)); *In re* Eynde, 480 F.2d 1364, 1370 (C.C.P.A. 1973) (explaining that an applicant can use references to establish the knowledge in the art).

135 For a list of relevant considerations, see *infra* note 160 and accompanying text.

136 *Genentech*, 108 F.3d at 1366 (emphasis added) (quoting Brenner v. Manson, 383 U.S. 519, 536 (1966)); *see also* Auto. Techs. Int'l, Inc. v. BMW of N. Am., Inc., 501 F.3d 1274, 1283–84 (Fed. Cir. 2007) (extending this reasoning to predictable technologies).

137 *Genentech*, 108 F.3d at 1366–67; *see also* Enzo Biochem, Inc. v. Calgene, Inc., 188 F.3d 1362, 1371–72 (Fed. Cir. 1999) (explaining that in both prosecution and litigation, the enablement determination "is made *retrospectively*, *i.e.*, by looking back to the filing date of the patent application and determining whether undue experimentation *would have been* required to make and use the claimed invention at that time"); *In re* Glass, 492 F.2d 1228, 1232 (C.C.P.A. 1974) (explaining that sufficiency is judged on an application's filing date).

138 *Genentech*, 108 F.3d at 1366.

139 *Id.* at 1368; *see also* Chiron Corp., v. Genentech, Inc. 363 F.3d 1247, 1254–56 (Fed. Cir. 2004) (affirming the district court's conclusion of nonenablement because the written description for the claimed monoclonal antibodies lacked a "specific and useful teaching" (quoting *Genentech*, 108 F.3d at 1368)).

ples has led courts to conclude that the putative invention is inoperative[140] and, therefore, unteachable.[141] For example, in *In re Eltgroth*,[142] the invention related to a method for controlling the aging process by manipulating the concentration of isotopes[143] of specific elements within an organism.[144] Although several references taught how to chemically manipulate the isotope concentrations, the U.S. Court of Customs and Patent Appeals[145] (C.C.P.A.) agreed with the Board of Patent Appeals' decision[146] that the invention was unpatentable because the applicant provided no tangible method for achieving the claimed result:

> Not one example is given. Not one isotope [affecting] aging is identified . . . . Moreover, appellant has . . . failed to show how knowledge available to [PHOSITAs] would enable them to make and use his invention despite the lack of specific disclosure. . . . [A]ppellant has provided no more than a speculative theory or hypothesis, highly significant though it may be . . . .[147]

The court rejected the application because it merely invited others to engage in undue experimentation to achieve the claimed result.[148]

Although patent applicants typically enjoy a presumption of operability,[149] *In re Eltgroth* and similar "incredible utility" cases create a strong presumption of inoperativeness because the alleged inventions

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140 *See supra* note 125.

141 If a claimed invention fails to satisfy the utility requirement of 35 U.S.C. § 101 (2006), the written description, as a matter of law, lacks enablement under § 112 because a PHOSITA cannot practice the invention. *See* Process Control Corp. v. HydReclaim Corp., 190 F.3d 1350, 1358 (Fed. Cir. 1999); *In re* Ziegler, 992 F.2d 1197, 1200–01 (Fed. Cir. 1993).

142 419 F.2d 918 (C.C.P.A. 1970).

143 Isotopes are atoms of a particular element with an atypical number of neutrons in their nuclei.

144 *In re Eltgroth*, 419 F.2d at 918–19.

145 The C.C.P.A. was the predecessor to the Federal Circuit. *See supra* note 41.

146 The Board of Patent Appeals was the predecessor to the Board of Patent Appeals and Interferences ("Board"). *See supra* note 121. In its appellate role, the Board reviews adverse decisions of examiners. *See* 35 U.S.C. § 6(b) (2006). An applicant whose claims have been twice rejected by the examiner may appeal to the Board. *Id.* § 134(a) (2006). The Board can affirm a rejection or reverse and remand to the examining corps. 37 C.F.R. § 1.197 (2009) (promulgating Patent Office regulations pertaining to the Board). An applicant dissatisfied with a Board decision can appeal to the Federal Circuit. 35 U.S.C. § 141 (2006).

147 *In re Eltgroth*, 419 F.2d at 921.

148 *Id.*

149 *See In re* Brana, 51 F.3d 1560, 1566 (Fed. Cir. 1995) (articulating the presumption of utility and the burden-shifting framework).

clearly conflict with recognized scientific principles.[150] But on those occasions where applicants overcame this strong presumption of inoperability, it was the working example that provided the best evidence that the state of the art had advanced far enough to allow a PHOSITA to achieve the claimed result.[151]

Finally, the C.C.P.A. wisely recognized that the research costs associated with providing working examples might be cheaper than the costs associated with fighting over enablement with the Patent Office or with alleged infringers in patent litigation. In *In re Strahilevitz*,[152] the invention related to methods and devices for removing antigens from mammalian blood through dialysis.[153] The examiner rejected the claims for nonenablement because the applicant disclosed no working examples, experimental data, or descriptions of treatments on humans or animals.[154] Rather, the written description was "'replete with statements as to what *may* be done.'"[155] The Board, in affirming the examiner's rejection, recognized that, "'[w]hile . . . specific examples are not necessary to meet the requirements of Section 112, when present, they do provide good evidence that the disclosure is enabling and that the invention may be performed without undue experimentation.'"[156] The C.C.P.A. did not adopt the high standard and reversed in part because the applicant was able to point to known prior art techniques to fill in the gaps omitted from the

150 *See In re* Chilowsky, 229 F.2d 457, 462 (C.C.P.A. 1956) (articulating the strong presumption of operability). For more examples of "incredible utility" cases, see generally *In re* Swartz, 232 F.3d 862 (Fed. Cir. 2000) (generating energy with "cold fusion"), *cert. denied*, 539 U.S. 916 (2003); Newman v. Quigg, 877 F.2d 1575 (Fed. Cir. 1989) (perpetual motion machine), *cert. denied*, 495 U.S. 932 (1990); Fregeau v. Mossinghoff, 776 F.2d 1034 (Fed. Cir. 1985) (using a magnetic field to alter the taste of food); *In re* Ruskin, 354 F.2d 395 (C.C.P.A. 1966) (increasing the energy output of fossil fuels through exposure to a magnetic field).

151 For example, working examples helped the C.C.P.A. conclude that the scientific community would recognize that cancer is curable. *Compare In re* Citron, 325 F.2d 248, 249–53 (C.C.P.A. 1963) (explaining that applicants' invention relating to an alleged effective treatment for cancer, which lacked specific tests, experiments, or clinical data, asserted incredible utility in the light of the knowledge of the art), *with In re* Jolles, 628 F.2d 1322, 1326–28 (C.C.P.A. 1980) (concluding that clinical tests, combined with the close structural similarity of the claimed compounds with chemotherapeutics known in the art, would allow a PHOSITA to accept the claimed utility).

152 668 F.2d 1229 (C.C.P.A. 1982).

153 *Id.* at 1230.

154 *Id.* at 1231.

155 *Id.* (quoting examiner's findings).

156 *Id.* (quoting Patent and Trademark Office Board of Appeals).

disclosure.[157] Nonetheless, the court "recognize[d] that *working examples are desirable in complex technologies*" and, by providing good evidence of enablement, "might well have avoided a lengthy and, no doubt, expensive appeal."[158]

C. Potential Benefits

1. It Will Simplify the Enablement Inquiry

Given that the teaching function and enablement are inextricably related, it is worth exploring how the enablement inquiry will change under the new regime. Before doing so, it is necessary to briefly explain why the enablement analysis is difficult under the current framework. To begin, the ultimate determination of whether a PHOSITA can make and use the claimed invention without undue experimentation is a legal one, based on underlying factual inquiries.[159] Relevant considerations include the nature of the invention, the breadth of the claims, the level of predictability of the art, the quantity of experimentation necessary, the presence or absence of working examples, the amount of direction presented, the prior art, and the relative skill of those in the art.[160]

Perhaps not surprisingly, there is no consensus about where the enablement analysis should begin or, stated differently, which factor is most important. As discussed above, one enduring approach calls for first classifying the invention as predictable or unpredictable and then proceeding from there.[161] But Judge Giles S. Rich criticized the predictable-unpredictable dichotomy long ago because it ignores the pos-

157 *Id.* at 1232; *see also In re* Eynde, 480 F.2d 1364, 1370 (C.C.P.A. 1973) ("A patent applicant may offer evidence, such as patents and printed publications, to show the knowledge possessed by those skilled in the art, and thereby establish that a given disclosure is enabling.").

158 *In re Strahilevitz*, 668 F.2d at 1232 (emphasis added).

159 *See In re* Swartz, 232 F.3d 862, 863 (Fed. Cir. 2000).

160 *See In re* Wands, 858 F.2d 731, 737 (Fed. Cir. 1988). The list, commonly referred to as the *Wands* factors, found its roots in the Patent Office. *Cf. Ex parte* Forman, 230 U.S.P.Q. 546, 547 (B.P.A.I. 1986) ("The factors to be considered [in a determination of what constitutes undue experimentation] have been summarized as the quantity of experimentation necessary, the amount of direction or guidance presented, the presence or absence of working examples, the nature of the invention, the state of the prior art, the relative skill of those in that art, the predictability or unpredictability of the art and the breadth of the claims." (citing *In re* Rainer, 347 F.2d 574 (C.C.P.A. 1965)). The Federal Circuit has noted that the *Wands* factors are "illustrative [and] not mandatory." Amgen, Inc. v. Chugai Pharm. Co., 927 F.2d 1200, 1213 (Fed. Cir. 1991). What is relevant depends on the facts of each case. *See id.*

161 For deeper discussion of the predictable-unpredictable dichotomy, see generally Seymore, *supra* note 29; Seymore, *supra* note 40.

sibility, for example, that a mechanical invention can have unpredictable features.[162] More recently, various legal actors disagree about whether the enablement analysis should begin inwardly with the applicant's disclosure[163] or outwardly by gauging the PHOSITA's knowledge.[164] But regardless of where the analysis begins, the ultimate question is whether the enablement provided is commensurate with the claim scope sought.[165]

Under the new regime, the enablement analysis would begin with the working examples provided in the written description.[166] In addition to providing a ready mechanism for answering the commensurability question,[167] they provide the best evidence of enablement because, unlike prophetic examples, nothing is left to speculation or doubt.[168] Indeed, this approach will prevent the patentee from obtaining claim scope that extends beyond the patentee's contribution to the art.

2. It Will Yield More Robust Patents

An actual reduction to practice will afford patentees more robust protection by allowing them to disclose and claim better embodi-

162 *See In re* Bowen, 492 F.2d 859, 861–62 (C.C.P.A. 1974).

163 *See, e.g.*, Sitrick v. DreamWorks, LLC, 516 F.3d 993, 1000 (Fed. Cir. 2008) (noting that an enablement analysis begins with the disclosure).

164 Dennis Crouch contends that "enablement should begin with the knowledge of one skilled in the art and move forward from there." Patently-O, http://www.patentlyo.com/patent/2008/02/enablement-cont.html (Feb. 4, 2008, 03:43 CST).

165 *See* MPEP, *supra* note 44, § 2164.04 (instructing an examiner who suspects that one or more claims lack enablement to first construe the claims to determine their scope); AK Steel Corp. v. Sollac, 344 F.3d 1234, 1241 (Fed. Cir. 2003) (explaining that because a patent's written description must enable the full scope of the claimed invention, the enablement inquiry typically begins with a construction of the claims).

166 The presence (or absence) of working examples is particularly important for complex inventions. *See supra* Part II.A.2.

167 *See* Nat'l Recovery Techs., Inc. v. Magnetic Separation Sys., Inc., 166 F.3d 1190, 1196 (Fed. Cir. 1999) (holding that "the scope of the claims must be less than or equal to the scope of enablement"); Moy, *supra* note 81, at 1081 (discussing the benefits of central claiming). As I have written elsewhere, a patent application which lacks working examples can raise a presumption of undue experimentation, particularly in the unpredictable arts. *See* Seymore, *supra* note 29, at 154–58.

168 *Cf. In re* Lorenz, 305 F.2d 875, 878 (C.C.P.A. 1962) (stating that the strong and comprehensive language of § 112 evinces Congress's intent for applicants to "make a full and complete disclosure of their invention, leaving nothing to speculation or doubt"); *In re* Folkers, 344 F.2d 970, 975 (C.C.P.A. 1965) ("The specification must leave nothing to 'speculation or doubt,' or require one skilled in the art to experiment at great lengths before he can [practice] the invention." (quoting *In re Lorenz*, 305 F.2d at 878).

ments.[169] To begin, inventors usually spend some amount of time refining the invention.[170] These refinements produce a better invention—whether it be safer, cheaper, more efficient, more durable, or more effective.[171] Thus, if the invention is actually reduced to practice before filing, the patentee can describe and claim the refined embodiments in the patent application. Consequently, the patentee can better protect the embodiment being marketed since it is that embodiment which competitors will likely target.[172] The resulting patent, by disclosing the post-conception refinements to the invention, will "provide[ ] the public a readily available teaching of the most practicable device."[173]

3. It Will Bridge the Disconnect Between Science and Patent Law

Insisting on working examples (at least for complex inventions) will resolve a striking incongruity between the norms of scientific communication and the patent laws. A key distinction between the two is that the former focuses on work that has been done rather than on speculative results.[174] Indeed, in scientific publishing, the author-scientist must demonstrate an understanding of the underlying science

169 *See* note 23 (defining "embodiment").

170 Although the patent laws encourage prompt filing, "the public interest is also deemed to be served by allowing an inventor time to perfect his invention." TP Labs., Inc. v. Prof'l Positioners, Inc., 724 F.2d 965, 968 (Fed. Cir. 1984). So, while public use of the invention more than one year prior to filing can bar issuance of a patent under 35 U.S.C. § 102(b), a judicially created doctrine known as the experimental use exception can negate the bar by affording the inventor time to improve and perfect the invention. *See* City of Elizabeth v. Am. Nicholson Pavement Co., 97 U.S. 126, 134–38 (1877) (articulating the doctrine); Allen Eng'g Corp. v. Bartell Indus., Inc., 299 F.3d 1336, 1353 (Fed. Cir. 2002) (listing objective criteria for determining if a use is experimental).

171 Likewise, further tweaking may lead the inventor to conclude that it is not worth the time and expense of prosecuting a patent application. *See In re* Hamilton, 882 F.2d 1576, 1581 (Fed. Cir. 1989).

172 For example, a competitor can attempt to design around the invention or find flaws in the disclosure to invalidate it. *See infra* note 231 and accompanying text.

173 Brief of Amicus Curiae American Intellectual Property Law Association in Support of Petitioner at 9, Pfaff v. Wells Elecs., Inc., 525 U.S. 55 (1998) (No. 97-1130).

174 Even research grant proposals, which are inherently speculative because they *propose* research, often include some actual experimental results because it is virtually impossible to obtain a favorable review without strong preliminary data. *See, e.g.*, William Gerin, Writing the NIH Grant Proposal 82 (2006) (suggesting that the presence of preliminary data that "bear[s] directly on the research question at hand" is crucial to obtaining NIH funding); LIANE REIF-LEHRER, GRANT APPLICATION WRITER'S HANDBOOK 28 (4th ed. 2005) (stating that having "substantive preliminary results" improve the chances of getting funded).

and support alleged discoveries with actual results, that are often confirmed through replicate experiments.[175] Ultimately, the scientific community polices both the understanding and the alleged discoveries through peer review.[176]

By contrast, patent law does not require that an inventor understand the underlying science.[177] In addition, an applicant usually has no obligation to support the putative invention with actual proof.[178] These departures from the norms of science may exist because patent law is more concerned with the "thing" and less with the path to the "thing" or the acumen of the person who made it.[179] Nonetheless, the

175 *See, e.g.*, ADIL E. SHAMOO & DAVID B. RESNIK, RESPONSIBLE CONDUCT OF RESEARCH 51 (2d ed. 2009) ("The ability of other investigators to replicate the experiments by following the method in the published report is crucial to the advancement of science.").

176 Peer review "is quite efficient at screening out papers that are too speculative or where there are serious errors in the design of the study or in the analysis of data." KENNETH R. FOSTER & PETER W. HUBER, JUDGING SCIENCE 171 (1997); *see also* COMM. SCI., ENG'G, & PUB. POLICY, NAT'L ACAD. OF SCIS., ON BEING A SCIENTIST 33 (3d ed. 2009) (explaining that vetting research results through peer review improves the quality of scientific publications). For a deeper discussion of peer view in science, see ELIZABETH WAGER ET AL., HOW TO SURVIVE PEER REVIEW 1 (2002) (describing the concept of peer review as "an important milestone[ ] of funding and publication, the concept of critical discussion of ideas and findings [which] runs through the entire scientific process").

177 *See* Diamond Rubber Co. v. Consol. Rubber Tire Co., 220 U.S. 428, 435–36 (1911) ("It is certainly not necessary that [the inventor] understand or be able to state the scientific principles underlying his invention . . . ."); Newman v. Quigg, 877 F.2d 1575, 1581 (Fed. Cir. 1989) ("[I]t is not a requirement of patentability that an inventor correctly set forth or even know, how or why the invention works . . . ."); *In re* Libby, 255 F.2d 412, 415 (C.C.P.A. 1958) ("It is not necessary that a patentee should understand the scientific principles underlying his invention, so long as he makes a sufficient disclosure to enable other persons skilled in the art to practice the invention.").

178 *See* Hyatt v. Boone, 146 F.3d 1348, 1352 (Fed. Cir. 1998) ("[T]he inventor need not provide evidence of either conception or actual reduction to practice when relying on the content of the patent application."); discussion *supra* Part I.A. A narrow exception arises in "incredible utility" cases. *See supra* note 150 and accompanying text.

179 *See* Eames v. Andrews, 122 U.S. 40, 56 (1887) (explaining that an inventor's ignorance of the scientific principles is immaterial as long as the patent's disclosure sets forth the "thing" to be done so that it can be reproduced); Life Techs., Inc. v. Clontech Labs., Inc., 224 F.3d 1320, 1325 (Fed. Cir. 2000) ("'Patentability shall not be negatived by the manner in which the invention was made.'" (quoting 35 U.S.C. § 103(a))); Radiator Specialty Co. v. Buhot, 39 F.2d 373, 376 (3d Cir. 1930) ("It is with the inventive concept, the thing achieved, not with the manner of its achievement or the quality of the mind which gave it birth, that the patent law concerns itself."); *cf.* Earle v. Sawyer, 8 F. Cas. 254, 256 (C.C.D. Mass. 1825) (No. 4,247) (Story, J.) ("It is of no consequence, whether the thing be simple or complicated; whether it

heightened standard of disclosure will bridge the gap between patent law and the norms of science which, hopefully, will induce innovators to turn to patents for substantive technical information.

4. It Will Make Patents a Competitive Source of Technical Knowledge

Under the current regime, an innovator who seeks to understand an invention constructively reduced to practice must hope that the inventor chose to disclose the details in another medium.[180] When this does not happen, the innovator probably has a slim chance of extracting any substantive technical information from the patent's written description.[181] Under the new standard, the written description will eventually resemble the experimental section of a technical journal.[182]

Although patents may never achieve the elite status of academic literature, in some cases patents are a good alternative source of information because "the patent record is just as much a repository of accumulated public domain knowledge on which researchers may rely and build as the scientific literature is."[183] First, while scientific journals typically charge high subscription rates, patents are freely accessible to

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be by accident, or by long, laborious thought . . . that it is first done [because] [t]he law looks to the fact, and not to the process by which it is accomplished . . . .").

180 *See supra* note 84 and accompanying text.

181 *See* discussion *supra* Part I.

182 Articles in peer-reviewed scientific publications tend to include an abstract, introduction, experimental section, results, discussion, and conclusion. As the name implies, the experimental section discloses working examples and other experimental details. *See* sources cited *supra* note 96.

183 Charles R. McManis & Sucheol Noh, The Impact of the Bayh-Dole Act on Genetic Research and Development: Evaluating the Arguments and Empirical Evidence to Date 35 (Aug. 13, 2006) (unpublished manuscript, on file with the Berkley Center for Law & Technology) (manuscript at 35), *available at* http://www.law.berkeley.edu/institutes/bclt/ipsc/papers2/mcmanis.doc. McManis and Noh also evaluate an empirical study which suggests that, due to an anticommons effect, in cases where scientific research is published and subsequently patented, citations to the journal article may drop off once the corresponding patent issues. *Id.*; *see* Fiona Murray & Scott Stern, *Do Formal Intellectual Property Rights Hinder the Free Flow of Scientific Knowledge? An Empirical Test of the Anti-Commons Hypothesis*, 63 J. ECON. BEHAV. & ORG. 648, 664–68 (2007). In rejecting this hypothesis, McManis and Noh argue in the alternative that when the patent publishes, communication among researchers "might to some extent shift from the scientific literature to the patent record, with the issued patent becoming a focus of citations both in the scientific literature and in subsequent patent applications of academic researchers seeking to distinguish their follow-on innovation from the prior art." McManis & Noh, *supra* (manuscript at 33).

the public.[184] Second, patents can, at times, communicate knowledge more quickly,[185] or even in greater detail,[186] than other information sources. Third, when the patent system is the sole medium of disclosure, the document provides technical knowledge that would otherwise be inaccessible to the public.[187]

III. Criticisms and Limits of the Teaching Function

A. *Conflicting Policy Concerns*

Although working examples may provide the best teaching, competing policy concerns may explain why the courts have resisted making an actual reduction to practice the benchmark for disclosure.[188]

184 *See* U.S. Patent & Trademark Office, Patent Full-Text and Full-Page Image Databases, http://patft.uspto.gov (last visited Nov. 22, 2009) (providing free access for patents issued since 1790 and patent applications published since March, 2001).

185 Gordon & Cookfair, *supra* note 11, at 52. One excellent historical example is the case of the two inventions which shared the 1963 Nobel Prize in Chemistry:

> The discoveries of Ziegler and Natta in the field of olefin polymerization did not appear in the general chemical literature until about 1960, while their patents were filed in 1953 and published in several countries in 1955. People following the patent literature found the work, were able to base their research on the examples given in the patents, and started to expand on these famous inventions long before their appearance in the chemical journals.

Id. Nowadays many technical journals have electronic submission and expedited peer-review processes designed to facilitate quick dissemination. Similarly, relatively recent amendments to the patent statutes also facilitate quicker dissemination. Specifically, since 1999, most patent applications publish eighteen months after the earliest effective filing date. 35 U.S.C. § 122(b)(1)(A) (2006).

186 The norms of science dictate that scientists engage in full and open communication when they disclose research. *See* Robert K. Merton, The Sociology of Science 274 (Norman W. Storer ed. 1973). While researchers should respect this norm when drafting the experimental section of their journal articles, the details provided may be insufficient to replicate the experiment because the researcher can obtain a competitive advantage by choosing to keep certain techniques secret. Diana Hicks, *Published Papers, Tacit Competencies and Corporate Management of the Public/Private Character of Knowledge*, 4 Indus. & Corp. Change 401, 408 (1995). Indeed, academics and others who publish in journals "manage the release of their knowledge by choosing how much they disclose." *Id.* In contrast, the patent laws require, at least in theory, that the inventor fully disclose the invention. 35 U.S.C. § 112 (2006). For a recent investigation of the relationship between patenting and faculty publishing behavior, see generally Kira R. Fabrizio & Alberto Di Minin, *Commercializing the Laboratory: Faculty Patenting and the Open Science Environment*, 37 Res. Pol'y 914 (2008).

187 *See infra* note 233 and accompanying text.

188 Nonetheless, the courts' recent eagerness to invalidate patents for nonenablement suggests that the winds of change are possibly afoot. *See* Seymore, *supra* note 40, at 284–89.

First, given the complex nature of patent law and its apparently competing goals of fostering innovation and disseminating information, some might argue that a new disclosure regime tips the balance too far in one direction.[189] The primary concern is that it would delay entry into the patent system because the inventor would need to engage in additional pre-filing experimentation to produce working examples. This delay would arguably thwart innovation.[190] In addition, "the patent law[s] place[ ] strong pressure on filing the patent application early in the development of the technology, often before the commercial embodiment is developed or all of the boundaries [are] fully explored."[191] The concern here is that patentees who fail to file promptly will compromise their patent rights, both in the United States[192] and abroad.[193]

189 *See, e.g.*, Hormone Research Found., Inc. v. Genentech, Inc., 904 F.2d 1558, 1568 (Fed. Cir. 1990) (arguing that limiting the scope of the claims to the specific embodiments disclosed is a poor way to stimulate invention and discourages early disclosure). *But see* Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 480–81 (1974) (explaining that one purpose of the patent system is to promote disclosure of inventions which stimulates further innovation and permits the public to practice the invention once the patent expires).

190 Judge Newman argues that a patentee's obligation to disclose should not destroy the incentive to innovate:

> As implemented by the patent statute, the grant of the right to exclude carries the obligation to disclose the workings of the invention, thereby adding to the store of knowledge without diminishing the patent-supported incentive to innovate.
>
> But the obligation to disclose is not the principal reason for a patent system . . . . The reason for the patent system is to encourage innovation and its fruits . . . .

Paulik v. Rizkalla, 760 F.2d 1270, 1276 (Fed. Cir. 1985) (en banc).

191 Hilton Davis Chem. Co. v. Warner-Jenkinson Co., 62 F.3d 1512, 1536 (Fed. Cir. 1995) (en banc) (Newman, J., concurring), *rev'd on other grounds*, 520 U.S. 17 (1997); *see also* Edlyn S. Simmons, *Prior Art Searching in the Preparation of Pharmaceutical Patent Applications*, 3 DRUG DISCOVERY TODAY 52, 52 (1998) (explaining the importance of drafting broad generic claims which include hypothetical compounds in order to prevent competitors from developing them). In addition, some would even argue that the ability to obtain patent protection at the early stages of the inventive process is necessary in order to maintain the incentive for the investment of venture capital in research and development. *See* Dana Rohrabacher & Paul Crilly, *The Case for a Strong Patent System*, 8 HARV. J.L. & TECH. 263, 271 (1995). But while an actual reduction to practice may lead to a delay in filing, it may also yield a more robust patent which better protects the embodiment that is potentially marketed. *See* discussion *supra* Part II.C.2.

192 For example, an applicant must file a patent application within one year of disclosing the invention in a printed publication. 35 U.S.C. § 102(b) (2006). Likewise, if the invention is used in public, sold, or subject to an offer for sale in the United States, the applicant must file within one year of the event. *Id.* A fundamental

Second, several commentators and judges discourage tying claim scope too closely to those embodiments actually reduced to practice.[194] For example, Professors Merges and Nelson contend that limiting patent rights in this way would lead to a narrow patent that would have little value because an imitator could find minor variations over the disclosed embodiments.[195]

In response, it is important to recognize that the current disclosure framework itself can thwart innovation. Specifically, the broad ex ante incentives of the current regime can discourage ex post improvement activity. As an example of this problem, consider *O'Reilly v. Morse*.[196] Though he invented a telegraph that used his code, Samuel Morse obtained a patent with a claim that covered "the exclusive right to *every improvement* where the motive power is [electromagnetism], . . . and the result is the marking or printing intelligible charac-

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purpose of the § 102(b) "statutory bar" is to encourage prompt filing. Woodland Trust v. Flowertree Nursery, Inc., 148 F.3d 1368, 1370 (Fed. Cir. 1998); DURHAM, *supra* note 4, at 121–23 (explaining the threefold policy rationale for § 102(b)). In addition to the statutory bar, § 102(g) acts to "penalize[ ] the unexcused delay or failure of a first inventor to share the 'benefit of the knowledge of [the] invention' with the public after the invention has been completed." Checkpoint Sys., Inc. v. U.S. Int'l Trade Comm'n, 54 F.3d 756, 761 (Fed. Cir. 1995) (quoting *Paulik*, 760 F.2d at 1280 (Rich, J., concurring)). Professor Mark Lemley explains that:

> By waiting too long to file a patent application or inventing without giving the world the benefit of the invention, inventors lose not only their own rights to file for a patent but also the ability to prevent a second inventor who *does* give the world the benefit of the invention from obtaining her own patent.

Lemley & Tangri, *supra* note 17, at 1102 (citations omitted).

193 The one-year grace period available in the United States is not available in many foreign countries. In fact, most countries have an "absolute novelty" requirement such that any pre-filing disclosure, including activity by the inventor, is patent-defeating. *See, e.g.*, Convention on the Grant of European Patents, art. 54(2), Oct. 5, 1973, 1065 U.N.T.S. 255, 272. Accordingly, if foreign filing is contemplated, the applicant must take steps to avoid inadvertent or premature disclosure. *See* DAVID A. BURGE, PATENT & TRADEMARK TACTICS & PRACTICE 127–36 (3d ed. 1999) (detailing foreign patent filing procedures).

194 *See, e.g.*, Invitrogen Corp. v. Clontech Labs., Inc., 429 F.3d 1052, 1071 (Fed. Cir. 2005) (arguing that narrow patent rights become worthless as new modes of practicing the inventor develop); Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 845 (1990); *accord* SRI Int'l v. Matsushita Elec. Corp., 775 F.2d 1107, 1121 (Fed. Cir. 1985) (explaining that the law does not require that an applicant describe every conceivable embodiment of the invention).

195 Merges & Nelson, *supra* note 194, at 845.

196 56 U.S. (15 How.) 62 (1854). For a fuller discussion of *Morse* and interesting tidbits surrounding the case, see KENNETH SILVERMAN, LIGHTNING MAN 319–24 (2003).

ters, signs, or letters at a distance."[197] In striking down the claim, the Supreme Court stated:

> It is impossible to misunderstand the extent of this claim.
>
> If this claim can be maintained, it matters not by what process or machinery the result is accomplished. . . . [S]ome future inventor, in the onward march of science, may discover a mode of writing or printing at a distance [with electromagnetism] without using any part of the process or combination set forth in the plaintiff's specification.
>
> . . . In fine he claims an exclusive right to use a manner and process which he has not described and indeed had not invented . . . .[198]

So, while Morse's written description taught and enabled telegraphy with his device, had the claim survived, it would have dominated other technological innovations that only subsequent workers in the field could teach and enable.[199]

To illustrate this last point, consider text messaging, which clearly falls within the scope of Morse's claim.[200] If Morse's patent were in force at the time of its advent, inventors would have had to consider at least three things: (1) whether they would need to obtain a license from Morse during the development and experimental stages of the technology to avoid infringement;[201] (2) that a text messaging patent would be "subservient" to Morse's "dominant" patent;[202] and (3) that a potential licensee of the text messaging patent would have to obtain

197 *O'Reilly*, 56 U.S. (15 How.) at 112 (emphasis added).

198 *Id.* at 112–13.

199 Richard H. Stern, *Solving The Algorithm Conundrum: After 1994 in the Federal Circuit Patent Law Needs a Radical Algorithmectomy*, 22 AIPLA Q.J. 167, 211 (1994).

200 *See* Alan Durham, *Natural Laws and Inevitable Infringement*, 93 MINN. L. REV. 933, 957–58 (2009) (discussing overly broad claims involving natural phenomena).

201 *See infra* notes 231–32 and accompanying text.

202 *See* Stern, *supra* note 199, at 172 n.14. To begin, the patent laws allow an improver to obtain a patent for an invention which is a novel and nonobvious variant of a device covered by a broader claim. Cochrane v. Deener, 94 U.S. 780, 787 (1876) ("One invention may include within it many others, and each and all may be valid at the same time."). As Merges and Nelson explain:

> Two patents are said to block each other when one patentee has a broad patent on an invention and another has a narrower patent on some improved feature of that invention. The broad patent is said to "dominate" the narrower one. In such a situation, the holder of the narrower ("subservient") patent cannot practice her invention without a license from the holder of the dominant patent. At the same time, the holder of the dominant patent cannot practice the particular improved feature claimed in the narrower patent without a license.

a license from Morse to practice the invention.[203] In sum, Morse's patent "would take away, or at least diminish, their potential rewards as incentive to invent and would thus discourage their creative efforts."[204]

Of course, the corollary to this is that a narrow patent scope can foster innovation by making it easier for subsequent inventors to improve on existing patented technology.[205] A more technically robust patent document, replete with working examples, will allow follow-on innovators to more easily and quickly create second-generation products and processes.[206] But, just as importantly, the new regime will promote the diffusion of knowledge across disciplines. Given the increased interest in interdisciplinary knowledge transfer, it may foster the cross-pollination of ideas and serve as a driver for more creative innovation.[207]

Merges & Nelson, *supra* note 194, at 860–61. Importantly, "the dominant patentee can exclude the subservient patentee from practicing her invention *at all*, and the subservient patentee can exclude the dominant patentee from practicing [the improvement]." *Id.* at 861 n.96 (emphasis added); *see also* Cantrell v. Wallick, 117 U.S. 689, 694 (1886) (explaining that where one patent is an improvement on another patent, "neither of the two patentees can lawfully use the invention of the other without the other's consent").

203 *See* Stern, *supra* note 199, at 172 n.14.

204 *Id.* at 172; *accord* The Incandescent Lamp Patent, 159 U.S. 465, 476 (1895) (explaining that overbreadth "operate[s] rather to discourage than to promote innovation").

205 Ronald J. Gilson, *The Legal Infrastructure of High Technology Industrial Districts: Silicon Valley, Route 128, and Covenants Not to Compete*, 74 N.Y.U. L. REV. 575, 628 (1999); *see also* Merges & Nelson, *supra* note 194, at 907 (a patent holder who licenses widely and collects royalties is more conducive to development of multiple applications). And "[w]hile it is intuitive that broader patents are more valuable than narrower ones, even a narrow patent that is properly placed can have significant value, sometimes more so than a broader patent covering a wide swath of a less lucrative or developed field." John R. Allison et al., *Valuable Patents*, 92 GEO. L.J. 435, 440 (2004).

206 Here it is important to repeat that an applicant need not provide a working example for every embodiment encompassed by a claim. *Cf. In re* Grimme, 274 F.2d 949, 952 (C.C.P.A. 1960) ("It is manifestly impracticable for an applicant who discloses a generic invention to give an example of every species falling within it . . . ."). Rather, the precise number required will depend on the nature of the technology and vary from case to case. *In re* Shokal, 242 F.2d 771, 773 (C.C.P.A. 1957) ("Thus, in the case of a small genus . . . consisting of four species, a reduction to practice of three, or perhaps even two, might serve to complete the generic invention, while in the case of a genus comprising hundreds of species, a considerably larger number of reductions to practice would probably be necessary.").

207 *See generally* ANDREW HARGADON, HOW BREAKTHROUGHS HAPPEN (2003) (examining the strategies and work practices of firms that have built an enduring capacity for breakthrough innovations); SYSTEMS OF INNOVATION (Charles Edquist ed., 1997); Stine Grodal & Grid Thoma, Cross-Pollination in Science and Technology: The Emer-

B. Teaching Whom?

In addition to the competing policy concerns, transforming the patent into a readable teaching document raises questions about the audience. The first concern is that while the public is the ultimate beneficiary of the disclosure,[208] the document is written to enable a PHOSITA, and not the general public, to be able to practice the invention.[209] Judge Newman believes that the written description should not contain known scientific information because it would greatly enlarge the size of the patent document, increase the cost of patent prosecution, and "obfuscate rather than highlight the contribution to which the patent is directed."[210] Arguably, thicker patent documents would give pause to the Patent Office, jurists, and members of the patent bar.[211]

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gence of the Nanobio Subfield (Sept. 2006) (unpublished manuscript) (manuscript at 18–22), *available at* http://www.dime-eu.org/working-papers/wp13/science-and-technology (examining how the cross-pollination of ideas between nanotechnology and biotechnology yielded the new subfield of nanobiotechnology).

208 The disclosure requirement is necessary "in order to give the public, after the privilege shall expire, the advantage for which the privilege is allowed, and is the foundation of the power to issue a patent." Grant v. Raymond, 31 U.S. (6 Pet.) 218, 247 (1832).

209 *See, e.g.*, Verve, LLC v. Crane Cams, Inc., 311 F.3d 1116, 1119 (Fed. Cir. 2002) (explaining that patent documents are meant to be "a concise statement for persons in the field"); Ajinomoto Co. v. Archer-Daniels-Midland Co., 228 F.3d 1338, 1347 (Fed. Cir. 2000) (explaining that a patent "is not a scientific treatise, but a document that presumes a readership skilled in the field of the invention"); *In re* Folkers, 344 F.2d 970, 975–76 (C.C.P.A. 1965) ("Yet we also recognize that patent disclosures are not necessarily required to be meaningful and intelligible to the general public.").

210 *Ajinomoto*, 228 F.3d at 1346–47; *see also* Loom Co. v. Higgins, 105 U.S. 580, 586 (1881) ("[An applicant] may begin at the point where his invention begins, and describe what he has made that is new, and what it replaces of the old. That which is common and well known is as if it were written out in the patent . . . ."); A.B. Dick Co. v. Barnett, 288 F. 799, 801 (2d Cir. 1923) (noting that the written description is not addressed to people who are "ignorant" about the subject matter) (internal quotation marks and citation omitted); *cf. In re* Storrs, 245 F.2d 474, 478 (C.C.P.A. 1957) ("[Although] an applicant for a patent [must] give to the public a complete and adequate disclosure in return for the patent grant, the certainty required of the disclosure is not greater than that which is reasonable . . . . [I]t cannot be forgotten that the disclosure is not addressed to the public generally, but to those skilled in the art.").

211 In Judge Rich's opinion, "Not every last detail is to be described, else patent specifications would turn into production specifications, which they were never intended to be. United States specifications have often been criticized as too cluttered with details to give an easy understanding of what the invention really is." *In re* Gay, 309 F.2d 769, 774 (C.C.P.A. 1962); *see also* N. Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 941 (Fed. Cir. 1990) ("It is not fatal if some experimentation is needed,

The second concern, raised by Professor Timothy Holbrook, is that structural flaws in the patent system itself "inhibit the ability of a patent to perform a teaching function."[212] For example, he contends that the Federal Circuit's evisceration of the common law experimental use exception means that "[o]ne can read the patent but cannot make or use the invention for purposes of exploring its function or the manner in which it works [without risking infringement]."[213] Professor Holbrook also describes how the teachings in the written description are often untimely due to delays in publication.[214] Even if persons in several fields consult the patent for technical information, he concludes that the disclosure plays a limited teaching role, particularly if the patentee publishes the information in another medium.[215] Relatedly, Professor Katherine Strandburg contends that patent disclosures are of limited importance because inventions "self-disclose" through commercialization.[216]

First, I agree with Judge Newman that the patent's disclosure is directed to a limited audience. But while the written description need not become a scientific treatise, it is also true that, in many ways, a scientific publication and the patent document share similar goals—namely to disclose something novel,[217] to teach fellow artisans how to replicate the invention or discovery,[218] and to spur further innovation in the field.[219] And as discussed above, one long term consequence of the proposal is that the written description will eventually resemble a

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for the patent document is not intended to be a production specification."). Under current Patent Office practice, applicants must pay additional filing fees for applications which exceed a threshold page count. *See* 35 U.S.C. § 41(a)(1)(B) (2006).

212 Holbrook, *supra* note 28, at 139–46.

213 *Id.* at 140.

214 *Id.* at 143.

215 *See id.* at 146 (describing how "[p]atents can provide a . . . feedback loop to encourage teachings via pre-patent disclosures and publications," which "further supports the conclusion that the disclosure in the patent itself is not terribly relevant to enhancing the storehouse of knowledge").

216 *See* Strandburg, *supra* note 28, at 485–88; *cf.* Paulik v Rizkalla, 760 F.2d 1270, 1276 (Fed. Cir. 1985) (en banc) ("[I]t is a rare invention that cannot be deciphered more readily from its commercial embodiment than from the printed patent.").

217 Professor Rebecca Eisenberg argues that both the scientific community and the patent system favor full disclosure. *See* Rebecca S. Eisenberg, *Proprietary Rights and the Norms of Science in Biotechnology Research*, 97 YALE L.J. 177, 217 (1987).

218 *See* Univ. of Rochester v. G. D. Searle & Co., 358 F.3d 916, 922 n.5 (Fed. Cir. 2004) ("[T]he role of the specification is to teach, both what the invention is (written description) and how to make and use it (enablement).").

219 *See, e.g.*, Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 481 (1974) (explaining that a patent's addition of knowledge is so important to the public good "that the Federal Government is willing to pay the high price of . . . years of exclusive use for its

technical journal.[220] If this happens, it will advance the ability of the patent document to achieve these shared goals and may contribute significantly to bridging the divide between patent law and the experimental sciences. Including working examples, combined with some discussion of what is already known, serves a teaching role because they both provide context and allow the PHOSITA to more precisely (and more quickly) replicate the invention or discovery.

Second, many nonacademic patentees choose not to disclose the technical details of their inventions outside of the patent system. Indeed, most information disclosed in a patent does not appear in another medium.[221] This is particularly true in industry, where scientists publish relatively little.[222] Unlike academic inventors who must publish their work in order to obtain research funding, attract laboratory personnel, build a reputation, and earn tenure, industrial inventors often have little incentive to do so.[223] The highest priority for an industrial inventor is to generate results that show commercial promise and will ultimately find their way into a marketable product.[224] As

disclosure, which disclosure, it is assumed, will stimulate ideas and the eventual development of further significant advances in the art.").

220 *See supra* note 182 and accompanying text.

221 *See* Fromer, *supra* note 28, at 554 ("Much of the information contained in—or that ought to be in—patents is not published elsewhere."); Second OECD Ministerial Conference for Small and Medium-sized Enterprises, June 3–5, 2004, WORLD INTELL. PROP. ORG., *Intellectual Property (IP) Rights and Innovation in Small and Medium-Sized Enterprises*, ¶ 5 ("It has been estimated that patent documents contain 70% of the world's accumulated technical knowledge and that most of the information contained in patent documents is either never published elsewhere or is first disclosed through the publication of the patent application."), *available at* http://www.wipo.int/sme/en/documents/pdf/iprs_innovation.pdf (last visited Sept. 17, 2009).

222 *See generally* Benoît Godin, *Research and the Practice of Publication in Industries*, 25 RES. POL'Y 587 (1996) (presenting various explanations and using bibliometrics to assess the usefulness of publication in industry).

223 *See generally* RICHARD M. REIS, TOMORROW'S PROFESSOR (1997) (explaining the importance of publishing in academia); Anthony J. Kinney et al., *Publications from Industry. Personal and Corporate Incentives*, 134 PLANT PHYSIOLOGY 11, 11–15 (2004) (arguing that the lower publication rate in industry is less about secrecy and more about the complex balancing of personal and institutional interests). Several commentators contend that publishing can bring rewards to industry. *See, e.g.*, Rebecca Henderson & Iain Cockburn, *Measuring Competence? Exploring Firm Effects in Pharmaceutical Research*, 15 STRATEGIC MGMT. J. 63, 77 (1994) (finding that in drug discovery, firms which encourage publication in the open literature and use it as a criterion for promotion are more productive than their rivals).

224 Partha Dasgupta & Paul A. David, *Information Disclosure and the Economics of Science and Technology*, *in* ARROW AND THE ASCENT OF MODERN ECONOMIC THEORY 519, 522 (George R. Feiwel ed., 1987) ("Roughly speaking, the [academic] scientific community appears concerned with the *stock* of knowledge and is devoted to furthering its

a practical matter, industrial inventors may simply lack the time to write while on the job or work for an employer who does not want them to expend the extra mental energy required to put an article together.[225] And, while publications may benefit industrial researchers in a personal sense, many companies do not offer rewards for them as they often do for patents.[226]

Third, most patented inventions are never commercialized or even licensed.[227] For the tiny fraction that see the light of day as a marketable product, reverse engineering is often time-intensive, inaccurate, difficult, or wholly impractical.[228] This is particularly true for

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growth, whereas the [industrial] technological community is concerned with the private economic *rents* that can be earned from that stock."); Derek J. de Solla Price, *Is Technology Historically Independent of Science? A Study in Statistical Historiography*, 6 TECH. & CULTURE 553, 561 (1965) (arguing that while the chief motivation of a scientist is to publish, the chief motivation of a technologist is to produce a product or process with limited disclosure before patent rights are secured).

225 *See* Hicks, *supra* note 186, at 412 ("After all, writing papers makes no money and consumes time."). Some industrial employers, however, support and even reward publication and conference attendance in an effort to attract productive scientists and to boost their prestige in academic and corporate communities. *See* G. Steven McMillan et al., *Firm Management of Scientific Information: An Empirical Update*, 30 RES. & DEV. MGMT. 177, 180–81 (2000).

226 Hicks, *supra* note 186, at 412–13. *But see supra* note 226 (explaining that rewarding publications can also convey benefits to industry).

227 *See* WILLIAM M. LANDES & RICHARD A. POSNER, THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW 320 n.52 (2003) (explaining that more than ninety-five percent of patents are unlicensed and that ninety-seven percent of patents generate no royalties); Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV. 1495, 1508–11 (2001) (arguing that devoting more attention and resources to improved patent examination across the board is unnecessary since most patents are never licensed or litigated); Doug Lichtman, *Substitutes for the Doctrine of Equivalents: A Response to Meurer and Nard*, 93 GEO. L.J. 2013, 2022–23 (2005) ("[M]ost patents sit idle after issuance, never brought into litigation and never used as the basis for licensing negotiations.").

228 *See generally* Pamela Samuelson & Suzanne Scotchmer, *The Law and Economics of Reverse Engineering*, 111 YALE L.J. 1575 (2002) (examining the legal developments surrounding reverse engineering and their economic consequences); Maureen A. O'Rourke, *Toward a Doctrine of Fair Use in Patent Law*, 100 COLUM. L. REV. 1177, 1234–35 (2000) (examining the difficulties of reverse engineering); *The Disclosure Function of the Patent System*, *supra* note 17, at 2016–17 (examining the economic limitations of reverse engineering); Edwin Mansfield, *How Rapidly Does New Industrial Technology Leak Out?*, 34 J. INDUS. ECON. 217, 221 (1985) ("It often takes considerable time to invent around patents (if they exist), to develop prototypes, to alter or build plant and equipment, and to engage in the manufacturing and marketing start-up activities required to introduce an imitative product or process.").

technically complex inventions like those in the chemical arts.[229] But even when reverse engineering is possible, the lapse in time between the initial publication and the fruits of this process can be great.[230] Further complicating reverse engineering and design-around activities[231] is the potential risk of patent infringement, particularly due to the Federal Circuit's evisceration of the common-law experimental use exception.[232] In the end, reverse engineering plays a limited teaching role.

It is precisely in these contexts, when the patent system is the sole medium of disclosure, that the proposal is most important. Under the current regime, any hope of extracting substantive technical information from the disclosure is essentially lost if the patent document is unreadable.[233] By contrast, adopting the heightened disclosure framework will transform patents emerging from industrial research into readable teaching documents, which may become rich repositories of useful technical knowledge.[234]

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229 *See* Lee Kovarsky, *A Technological Theory of the Arms Race*, 81 IND. L.J. 917, 960 (2006) (arguing that when reverse engineering is difficult, the inventor may forsake patent protection in favor of trade secrecy); Munson, *supra* note 25, at 697–99 (explaining the difficulties for those in the chemical arts intent on reverse engineering).

230 *See* Samuelson & Scotchmer, *supra* note 228, at 1585–88 (describing the time-consuming research and development steps involved in reverse engineering a product).

231 Although the patentee can exclude others from practicing the invention until the patent term expires, there is hope that the patent will foster innovation by inducing others to design around the invention and make new products and processes. The incentive to design around a patent is a positive result of the patent system. *See* London v. Carson Pirie Scott & Co., 946 F.2d 1534, 1538 (Fed. Cir. 1991) (explaining that designing or inventing around patents should be encouraged); State Indus., Inc. v. A.O. Smith Corp., 751 F.2d 1226, 1235–36 (Fed. Cir. 1985) (stating that designing around an invention lies at the heart of competition and ultimately benefits the consumer).

232 Ted Hagelin, *The Experimental Use Exemption to Patent Infringement: Information on Ice, Competition on Hold*, 58 FLA. L. REV. 483, 494–504 (2006); *see also* Holbrook, *supra* note 28, at 139–40 ("Commenters have well documented the Federal Circuit's hostility to the common law experimental use defense . . . ."). The doctrine of equivalents also creates problems when trying to design around a patent. *See* Paul N. Katz & Robert R. Riddle, *Designing Around a United States Patent*, 45 S. TEX. L. REV. 647, 665–68 (2004); Cecil D. Quillen, Jr., *Commentary on Bessen and Meurer's* Patent Failure*: An Industry Perspective*, 16 J. INTELL. PROP. L. 57, 79 (2008) (explaining "[t]he doctrine of equivalents, which is patent law's 'catch 22' because it makes infringers out of innovators who have successfully designed around a patent's claims"); *supra* note 101 (explaining the doctrine).

233 *See supra* note 26 and accompanying text.

234 *See* discussion *supra* Part II.B.

C. The Disclosure-Dedication Rule

Advocating a heightened disclosure standard raises concerns about the disclosure-dedication rule.[235] It states that subject matter which the patentee discloses in the written description, but does not claim, is dedicated to the public.[236] When the rule is applied, it bars a finding of patent infringement when an accused infringer practices the disclosed but unclaimed subject matter.[237] One purpose of the rule is to discourage applicants from narrowly claiming an invention to avoid prosecution scrutiny by the Patent Office and then, after issuance, relying on the broad disclosure to enlarge the scope of the claims in patent litigation.[238] This is particularly important when the patentee attempts to prove infringement under the doctrine of equivalents.[239]

Turning to potential tensions between the dedication rule and the teaching function, one concern is whether the rule creates a disincentive for applicants to disclose any more than is necessary to satisfy

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235 A lengthy discussion of the rule, and particularly its intersection with other patent law doctrines, is beyond the scope of this article. For a deeper discussion, see John R. Thomas, *Formalism at the Federal Circuit*, 52 AM. U. L. REV. 771, 781–83 (2003).

236 *See* Miller v. Brass Co., 104 U.S. 350, 352 (1881) ("[T]he claim of a specific device or combination, and an omission to claim other devices or combinations apparent on the face of the patent, are, in law, a dedication to the public of that which is not claimed."); Johnson & Johnston Assocs. v. R.E. Serv. Co., 285 F.3d 1046, 1054 (Fed. Cir. 2002) (en banc). To trigger the rule, and before unclaimed subject matter will be dedicated to the public, "that unclaimed subject matter must have been identified by the patentee as an alternative to a claim limitation." Pfizer, Inc. v. Teva Pharms. USA, Inc., 429 F.3d 1364, 1379 (Fed. Cir. 2005).

237 *See* Maxwell v. J. Baker, Inc., 86 F.3d 1098, 1106 (Fed. Cir. 1996). Thus, the rule "requires an inventor who discloses specific matter to claim it, and to submit the broader claim for examination." PSC Computer Prods., Inc. v. Foxconn Int'l, Inc., 355 F.3d 1353, 1360 (Fed. Cir. 2004).

238 *See* Genentech, Inc. v. Wellcome Found. Ltd., 29 F.3d 1555, 1564 (Fed. Cir. 1994); *PSC Computer Prods.*, 355 F.3d at 1361 (explaining that the disclosure-dedication rule should motivate patentees to draw the broadest claims that they consider to be patentable, and to submit these broad claims to the Patent Office for examination). In terms of policy, the rule reinforces the public notice function of patents. *See Johnson & Johnston*, 285 F.3d at 1052 (noting that, consistent with the notice function, the claim requirement presupposes that a patent applicant defines his invention in the claims, not in the written description); SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc., 242 F.3d 1337, 1341 (Fed. Cir. 2001) (explaining that the written description can assist the public in understanding the notice given in the claims by pointing out the portions of the relevant art the patent does not cover).

239 For a discussion of the doctrine of equivalents (DOE), see *supra* note 101. In determining the range of equivalents to which the patentee is entitled, the Federal Circuit has held that a patentee cannot use the DOE to recapture subject matter disclosed but deliberately left unclaimed. *See Johnson & Johnston*, 285 F.3d at 1054.

the disclosure requirements of § 112.[240] Another concern is whether a patentee who discloses too much and inadvertently claims too little will possibly trigger the rule.

While several commentators might disagree,[241] these concerns are not problematic. First, it is not easy to trigger the rule. For instance, the Federal Circuit has made clear that the dedication rule "does not mean that any generic reference in a written [description] necessarily dedicates all members of that particular genus to the public."[242] Rather, "[t]he disclosure must be of such specificity that [a PHOSITA] could identify the subject matter that had been disclosed and not claimed."[243]

Second, the patentee can take steps at the drafting stage to avoid public dedication problems. For example, the patentee should only disclose embodiments that will be claimed.[244] With respect to claim drafting, one attractive strategy is to draft narrower claims that are closely tied to the disclosed embodiments in the written description.[245] This may lead patentees to adopt a patenting strategy where they prosecute a group of smaller, discrete applications rather than a single, omnibus application.[246] These steps not only support the teaching function, but may also help the patentee avoid problems with enablement and prosecution history estoppel.[247]

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240 *See, e.g.*, *Johnson & Johnson*, 285 F.3d at 1064–72 (Newman, J., dissenting) (explaining that the majority opinion imposes legal obstacles to the disclosure of scientific information which will deter innovation).

241 *See, e.g.*, Raj S. Davé, *A Mathematical Approach to Claim Elements and the Doctrine of Equivalents*, 16 HARV. J.L. & TECH. 507, 516–18 (2003) (explaining that the *Johnson & Johnston* decision "will encourage broad claiming of all disclosed subject matter").

242 *PSC Computer Prods.*, 355 F.3d at 1360; *see also* Holbrook, *supra* note 28, at 165–67 (discussing the extent of disclosure required to trigger the rule).

243 *PSC Comp. Prods.*, 355 F.3d at 1360.

244 *See* Davé, *supra* note 241, at 517. Admittedly, as Professor John Thomas points out, this is easier done in certain fields than in others. *See* Thomas, *supra* note 235, at 801 (explaining that, while inventors in chemical, electrical, and mechanical fields can selectively draft written descriptions that claim one component of a larger product or process, those in biotechnological fields must claim each and every aspect of their inventions).

245 Patentees have devised various claiming methods to avoid dedication problems. *See, e.g.*, Davé, *supra* note 241, at 516–18. One commentator suggests that the patentee should draft the broadest claim to extend up to the boundaries defined by the prior art. *See* Robert A. Migliorini, *The Dedication to the Public Doctrine and Lessons for Patent Practitioners*, 87 J. PAT. & TRADEMARK OFF. SOC'Y 825, 839 (2005).

246 *See* Seymore, *supra* note 40, at 290.

247 *See id.*; Davé, *supra* note 241, at 516–18. Prosecution history estoppel is a judicially-created doctrine which bars a patentee from "'regaining, through litigation, coverage of subject matter relinquished during prosecution of the application for the patent.'" Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 734

Third, a patentee who discovers a potential dedication problem after filing has several remedies. For instance, if the patent has not issued, the patentee can either amend the pending claims to include the unclaimed subject matter,[248] add new claims directed to that subject matter,[249] or file a continuation application.[250] If the patent has issued, the patentee can file a reissue application within two years of the issue date and seek to enlarge the scope of the original claims to encompass the disclosed, but previously unclaimed, subject matter.[251]

Conclusion

It is time to transform the patent into a readable teaching document. When the shroud of jargon and formalism is stripped away and an actual reduction to practice becomes the standard of disclosure, a patent has the potential to become a repository of valuable technical knowledge competitive with other information sources. A more technically robust patent document will allow follow-on innovators to more easily and quickly improve on current technologies and will foster the diffusion of knowledge and more creative innovation within and across disciplines. And while this proposal would bridge the gap between the patent laws and the norms of scientific research, it will also sharpen the debate over the adequacy of disclosure and the proper scope of claims.

(2002) (quoting Wang Labs., Inc. v. Mitsubishi Elecs. Am., Inc., 103 F.3d 1571, 1577–78 (Fed. Cir. 1997)).

248 *See* 37 C.F.R. § 1.121 (2008) (describing the amendment process for patent applications).

249 *See id.*; Turbocare Div. of Demag Delaval Turbomachinery Corp. v. Gen. Elec. Co., 264 F.3d 1111, 1118 (Fed. Cir. 2001) (explaining that an applicant can add a claim after the original filing date as long as it finds support in the written description).

250 A continuation application is a second application for the same invention claimed in a parent (original) application, which is filed before the parent application issues as a patent or becomes abandoned. *See* 35 U.S.C. § 120 (2006). It has the identical written description as the parent and enjoys the benefit of the earlier filing date. *See id.* In sum, a continuation application is a new application with the same disclosure but different claims.

251 *See* 35 U.S.C. § 251 (2006) (stating that a broadened claim can be presented within two years from the grant of the original patent in a reissue application); *see also* Johnson & Johnston Assocs. v. R.E. Serv. Co., 285 F.3d 1046, 1055 (Fed. Cir. 2002) (en banc) (identifying reissue as a suitable way to retrieve unclaimed subject matter).