
PANEL VII
READY FOR PATENTING

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We give patents to inventors to reward and therefore encourage innovation. But what is the act of invention? Am I an inventor when I think of an idea? Or am I an inventor only when I actually get my invention to work, by building something or putting a process into practice? Courts and scholars have long struggled with the question of whether invention is primarily a mental act or instead primarily an act of building it—what patent law calls “reducing an invention to practice.”¹ William Robinson, the author of the leading nineteenth-century patent treatise, thought the most important act of invention was mental—the formation in the mind of a new idea.² For Robinson, as long as an idea was “practical” and “operative,” the act of writing it down in a patent was enough to give the benefit of it to the world.³ Justice Story, by contrast, saw the inventor’s central contribution as introducing new technology to the world, something that could only happen when the idea had been turned

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¹ 35 U.S.C. § 102(g) (2000). For discussions, see, for example, Christopher A. Cotropia, *What is the “Invention”?*, 53 WM. & MARY L. REV. 1855, 1875-91 (2012), comparing the often competing “external” and “claim-centered” theories of defining invention.

² 1 WILLIAM ROBINSON, THE LAW OF PATENTS FOR USEFUL INVENTIONS § 80, at 122-23 (1890) (“To him alone whose mind conceives the perfect, practical, operative idea—that idea which, when embodied in tangible materials, will accomplish the desired result—belongs the right of the inventor and the credit of performing the inventive act.”).

³ *Id.*

into a working, usable device or method.⁴ Interestingly, both agreed on one thing: Paper patentees—those who never made anything—were not sufficiently advancing the progress of the useful arts.⁵

Patent law has tried to find a middle ground between these two visions of invention. The definition of “invention” in the 1952 Patent Act (“the 1952 Act”) incorporates both conception and reduction to practice, sometimes defining the inventor as the person who conceived of an idea and other times as the one who reduced the idea to practice.⁶ But in trying to walk that middle ground, patent law has actually discouraged inventors from getting their inventions to work in practice, rewarding those who run to the patent office before they are fully done with the invention by giving them precedence over those who make sure their invention works by building and testing it before applying for a patent.⁷ In an important class of cases—those in which the inventor has an idea but does not yet know if it will work—the patent system encourages the inventor to patent first and figure it out later, if at all.⁸ And precisely because those inventors haven’t yet figured out what works, their patent claims tend to be more general, giving them broader rights than those who take the time to build and patent a working invention.⁹ The problem is even worse under the new America Invents Act (“AIA”) passed in 2011, which

⁴ *Earle v. Sawyer*, 8 F. Cas. 254, 256 (C.C.D. Mass. 1825) (Story, J.) (“The thing to be patented is not a mere elementary principle, or intellectual discovery, but a principle put in practice, and applied to some art, machine, manufacture, or composition of matter. . . . The law looks to the fact [of application], and not to the process by which it is accomplished.”).

⁵ See John F. Duffy, *Reviving the Paper Patent Doctrine*, 98 CORNELL L. REV. 1359, 1368-69 (2013). For a discussion of paper patents in history and an argument for reviving the doctrine, see *id.* at 1360-66. To be sure, there is more nuance here than is portrayed in the text. A sufficiently detailed set of instructions could be viewed as introducing a new technology even if the inventor wasn’t the one who actually built it. In theory, a patent ought to provide that sufficiently detailed set of instructions, see *id.* at 1372, though as I explain below, it often doesn’t.

⁶ 35 U.S.C. § 102(g) (2000) (outlining the conditions for patentability and noting that when evaluating if one may be awarded with a patent “there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other”).

⁷ In so doing, the law has implicitly adopted Ed Kitch’s prospect theory of the patent system, which gives broad rights to early inventors in hopes that they will then be incented to develop the invention. Edmund Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 276 (1977). For criticism of that theory, see, for example, Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, 1044-47 (1997); Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 872 (1990).

⁸ See Kitch, *supra* note 7, at 270-71 (“[P]ressures to immediate application exist because the patent system does not require a finished, commercially relevant invention. It only requires something that works.”).

⁹ See *id.*

encourages patentees to file their applications as soon as possible.¹⁰ Indeed, those who actually build and test an invention under the new statute before filing a patent application may even find that they have lost their rights by doing so.¹¹

The fact that the law encourages an inventor to file first and figure out later how (or even if) the invention works for its intended purpose is unfortunate. It produces underdeveloped patent applications that do not communicate useful information to the world.¹² It facilitates the rise of patent trolls who obtain patents but never bother to produce a product, instead making a business of suing those who do.¹³ And it pushes people to patent inventions just in case, adding more patents into a system already overburdened with them.¹⁴

Some have suggested that we should require patentees to actually make products¹⁵ or at least build and test prototypes before filing their patent applications.¹⁶ But doing so would have its own worrisome consequences, not

¹⁰ 35 U.S.C. § 102 (2012).

¹¹ See *infra* notes 62-66 and accompanying text.

¹² See David S. Abrams & R. Polk Wagner, *Poisoning the Next Apple? The America Invents Act and Individual Inventors*, 65 STAN. L. REV. 517, 551 (2013).

¹³ See generally Duffy, *supra* note 5, at 1363.

¹⁴ One reason to patent early is to have something of legal significance to offer in licensing negotiations, helping to overcome Arrow's information paradox. Arrow's information paradox posits that, without some form of property rights, parties will find it difficult to contract for the sale of information. Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS 609, 614-16 (1962) (“[T]here is a fundamental paradox in the determination of demand for information; its value for the purchaser is not known until he has the information, but then he has in effect acquired it without cost. Of course, if the seller can retain property rights in the use of the information, this would be no problem, but given incomplete appropriability, the potential buyer will base his decision to purchase information on less than optimal criteria.”). As I have argued elsewhere, however, patents are not the only solution to this paradox. Inventors can and do bargain around trade secret rights as well. Mark A. Lemley, *The Surprising Virtues of Treating Trade Secrets as IP Rights*, 61 STAN. L. REV. 311, 313 (2008).

¹⁵ See, e.g., Joseph A. Yosick, *Compulsory Patent Licensing for Efficient Use of Inventions*, 2001 U. ILL. L. REV. 1275, 1288 (arguing that a patent holder should be forced to issue a compulsory license where the instant patent is not being “worked,” a term that encompasses both production and availability of a product); Richard A. Posner, *Patent Trolls Be Gone*, SLATE (Oct. 15, 2012), http://www.slate.com/articles/news_and_politics/view_from_chicago/2012/10/patent_protection_how_to_fix_it.html [https://perma.cc/DEG8-VGXJ] (“We could make the granting of a patent contingent on producing the product or process that incorporated the invention, within a specified time.”).

¹⁶ E.g., Christopher A. Cotropia, *The Folly of Early Filing in Patent Law*, 61 HASTINGS L.J. 65, 92 (2009). Notably, the Patent and Trademark Office (“PTO”) used to require the submission of models of an invention in the early nineteenth century. See *The Commissioner of Patents on Models*, SCI. AM., Feb. 23, 1878, at 113 (discussing the history of the model requirement and why it was no longer needed).

least the fact that a scientific article could invalidate a patent without itself containing enough information to permit its author to file a patent. The result is a difficult problem for patent doctrine, one that is only exacerbated by the coming wave of cases under the AIA. But whatever the right answer to that problem is, we should not be in the position in which we currently find ourselves: treating inventors *less* favorably if they try to build and test their inventions before patenting.¹⁷

In Part I, I walk through the often-confusing rules in the 1952 Act that determine what an inventor must show and when an invention is ready for patenting, and demonstrate that the regime we have created favors those who patent before building and testing a prototype. In Part II, I explore how the new patent rules in the AIA potentially exacerbate this problem. In Part III, I consider some possible solutions designed to encourage inventors to implement and test their ideas before patenting them.

I. THE 1952 ACT: “WILL WORK FOR ITS INTENDED PURPOSE”

Under the 1952 Act, the key triggering event associated with a patent is the date of invention.¹⁸ As between two competing patent applicants, the 1952 Act (which applies to patent applications filed before March 16, 2013)¹⁹ awarded the patent to the first to invent it.²⁰ And when a patent examiner or an accused infringer argues that the patent is not valid because the invention is disclosed in the prior art, the patentee can defeat that argument by showing that they invented before the effective date of that prior art.²¹

But what exactly is “invention”? Historically, the answer has involved the actual making of a device that works.²² The goal of patent law on this view is the contribution of a tangible, practical thing to the world. The Supreme Court in the nineteenth century held that an invention was not complete until it had been reduced to practice:

¹⁷ Others have suggested treating those who don’t make products less favorably under the law. *See, e.g.*, Duffy, *supra* note 5, at 1360-63. More on this later.

¹⁸ Abrams & Wagner, *supra* note 12, at 520.

¹⁹ *See* U.S. PATENT & TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE § 2159 (9th ed. Nov. 2015) (discussing transition dates).

²⁰ 35 U.S.C. § 102(b) (2012).

²¹ 35 U.S.C. § 102(g) (2000) (explaining that a person is not entitled to a patent if another inventor is able to establish that she created the invention first); 37 C.F.R. § 1.131(a) (2014) (“When any claim of an application or a patent under reexamination is rejected, the applicant or patent owner may submit an appropriate oath or declaration to establish invention of the subject matter of the rejected claim prior to the effective date of the reference or activity on which the rejection is based.”).

²² *See* Clark Thread Co. v. Willimantic Linen Co., 140 U.S. 481, 489 (1891) (“It is evident that the invention was not completed until the construction of the machine.”); Earle v. Sawyer, 8 F. Cas. 254, 256 (C.C.D. Mass. 1825) (Story, J.).

Crude and imperfect experiments are not sufficient to confer a right to a patent; but in order to constitute an invention, the party must have proceeded so far as to have reduced his idea to practice, and embodied it in some distinct form.²³

Inventions on this view often start as ideas—though not always; many important inventions in history were accidental.²⁴ But they are not inventions until they actually result in a tangible thing or a process that operates on and transforms the real world.²⁵ On this view, an invention requires reducing an idea to a tangible thing that actually works for its intended purpose—that achieves something useful in the world.²⁶ Those who do that are inventors; those who don't may be smart and may even advance knowledge, but they haven't made the world a better place.

Reduction to practice in this sense does not necessarily require that the patentee commercialize the invention.²⁷ But it requires that the inventor know that the invention actually works for its intended purpose.²⁸ Often that requires

²³ *Seymour v. Osborne*, 78 U.S. 516, 522 (1870). The issue is complicated by the fact that in the early part of the nineteenth century, patent claims were not intended to define the outer bounds of the invention, but rather to identify the central thing invented. See Dan L. Burk & Mark A. Lemley, *Fence Posts or Sign Posts? Rethinking Patent Claim Construction*, 157 U. PA. L. REV. 1743, 1746-47 (2009). For a discussion of the complications of this doctrine in an era before peripheral claiming, see Joshua D. Sarnoff, *The Historic and Modern Doctrines of Equivalents and Claiming the Future, Part I (1790-1870)*, 87 J. PAT. & TRADEMARK OFF. SOC'Y 371, 386-91 (2005) (“Courts . . . had to resolve how broad a principle the inventor could regard as his invention and thus could claim in the patent, given that inventors reduce to practice before patenting at most a limited set of embodiments of the invented principle.”).

²⁴ For a discussion of a number of prominent examples, see Mark A. Lemley, *The Myth of the Sole Inventor*, 110 MICH. L. REV. 709, 731-35 (2012) (explaining that while most important inventions result from simultaneous invention by multiple inventors, other important inventions result instead from mere accidents) and Sean B. Seymore, *Serendipity*, 88 N.C. L. REV. 185, 186-90 (2009) (observing that inventors more commonly stumble upon accidental inventions in unpredictable scientific fields such as chemistry).

²⁵ *Cf. Corona Cord Tire Co. v. Dovon Chem. Corp.*, 276 U.S. 358, 382-83 (1928) (holding that commercialization of the invention was not required, but “the necessary reduction to use” could be proven by showing that the invention did work as described); *Ulramercial, Inc. v. Hulu LLC*, 772 F.3d 709, 721 (Fed. Cir. 2014) (Mayer, J., concurring) (“[T]he patent system does not extend to all products of human ingenuity. Because the system’s objective is to encourage ‘the onward march of science,’ its rewards do not flow to ideas—even good ones—outside of the technological arena.” (citations omitted)).

²⁶ See *Corona Cord*, 276 U.S. at 384.

²⁷ *Id.*

²⁸ See, e.g., *Estee Lauder Inc. v. L’Oreal, S.A.*, 129 F.3d 588, 593 (Fed. Cir. 1997) (“[I]n addition to preparing a composition, an inventor must establish that he ‘knew it would work,’ to reduce the invention to practice. . . . [A] reduction to practice does not occur until an inventor, or perhaps his agent, knows that the invention will work for its intended purpose.” (citation omitted)). The *Estee Lauder* court held that an inventor who had sent a

building and testing a model. Indeed, patent law early on developed a concept of experimental use that permitted an inventor who had built a working prototype of her invention to test that invention to make sure it worked for its intended purpose without losing her right to a patent by doing so.²⁹

But that view of invention has long coexisted with a second view, one that treats the mental act as the inventor's paramount contribution. While that view has roots going back to Robinson's famous 1890 patent treatise,³⁰ its fullest expression came in the Supreme Court's 1998 decision in *Pfaff v. Wells Electronics, Inc.*³¹ There, the Court distinguished its nineteenth-century cases and concluded that "[t]he primary meaning of the word 'invention' in the Patent Act unquestionably refers to the inventor's conception rather than to a physical embodiment of that idea."³² For courts and scholars that take this view, the primary contribution of an invention is the idea itself. Various people can implement the idea once it is disclosed, but no one could do so without the initial mental act—the conception of the idea itself. On this view, implementation is less important. Indeed, one purpose of the patent system might be to permit people with ideas to sell those ideas to others who will test or implement them.³³

composition out for testing but had not yet received the successful test results did not yet know that the invention would work for its intended purpose and therefore had not yet actually reduced the invention to practice. *Id.* at 594-95.

²⁹ Compare *Elizabeth v. Pavement Co.*, 97 U.S. 126, 135 (1877) (explaining that even though an inventor may experiment and find no need to alter his invention, "he may be justly said to be using his machine only by way of experiment; and no one would say that such a use, pursued with a *bona fide* intent of testing the qualities of the machine, would be a public use, within the meaning of the statute"), with *Lough v. Brunswick Corp.*, 86 F.3d 1113, 1121 (Fed. Cir. 1996) (holding that the plaintiff did not satisfy the experimental use exception because there was insufficient evidence to find the prototypes were distributed to third parties for purposes of experimentation). Experimentation is permitted to stop the clock only until reduction to practice is complete. *Zacharin v. United States*, 213 F.3d 1366, 1369 (Fed. Cir. 2000); *Cont'l Plastic Containers v. Owens Brockway Plastic Prods., Inc.*, 141 F.3d 1073, 1079 (Fed. Cir. 1998). Market testing to gauge consumer demand is not experimental use. *In re Smith*, 714 F.2d 1127, 1135 (Fed. Cir. 1983).

³⁰ 1 ROBINSON, *supra* note 2, § 80 (1890) ("To him alone whose mind conceives the perfect, practical, operative idea,—that idea which, when embodied in tangible materials, will accomplish the desired result,—belongs the right of the inventor and the credit of performing the inventive act.").

³¹ 525 U.S. 55 (1998).

³² *Id.* at 60; see also *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1376-77 (Fed. Cir. 1986) (reversing the lower court's invalidation of a patent after finding that the concept behind the patent was conceived by the patentee prior to that of another claimed invention).

³³ See, e.g., Jonathan M. Barnett, *Intellectual Property as a Law of Organization*, 84 S. CAL. L. REV. 785, 791 (2011); Daniel F. Spulber, *How Patents Provide the Foundation of the Market for Inventions*, 11 J. COMPETITION L. & ECON. 271, 291-93 (2015).

Notably, conception of an invention does *not* require that the inventor know that the invention will work for its intended purpose. I can conceive of an invention without having any idea whether or not it will work in practice. Indeed, I may not even know what my invention *is* as long as I can make it and have some concept of an intended use.³⁴ Figuring out whether an invention works often involves reduction to practice and experimentation.³⁵ But conception requires neither. While the definition of conception requires that the idea actually *turn out* to work,³⁶ the inventor does not need to understand why it works or even know whether it will turn out to work for a particular purpose in order to have conceived of the invention.³⁷ It is enough that the invention turns out to work.³⁸

At first blush, the 1952 Act seems to strike a middle ground between these views. Section 102(g) of the Act provides that when two parties both claim to

³⁴ See, e.g., *Abbott Labs. v. Geneva Pharms., Inc.*, 182 F.3d 1315, 1318-19 (Fed. Cir. 1999) (holding that a company that produced and sold a particular form of a chemical without knowing exactly what it was had nonetheless reduced it to practice and therefore started the one-year clock running). Nicole Fortuné argues that reduction to practice in *Abbott* is an alternative to proof of conception as evidence that the invention was ready for patenting. Nicole M. Fortuné, Comment, *Scaltech Inc. v. Retec/Tetra L.L.C. & Abbott Laboratories v. Geneva Pharmaceuticals, Inc.*, 15 BERKELEY TECH. L.J. 185, 205 (2000). For discussion of the policies underlying the on sale bar, see 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, 33-48 (1988).

In theory, the utility doctrine could require more—proof of operability. See ROBERT PATRICK MERGES & JOHN FITZGERALD DUFFY, *PATENT LAW AND POLICY: CASES AND MATERIALS* 255 (6th ed. 2013) (“[T]he utility doctrine is actually about timing If the utility requirement is relatively lax, then inventors can obtain a patent relatively early in their research”). In practice, however, the doctrine plays a very limited role in most industries. See Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1645-46 (2003) (pointing out that utility essentially never matters except in the life sciences). For an argument that a more robust utility doctrine could improve the patent system, see Michael Risch, *Reinventing Usefulness*, 2010 BYU L. REV. 1195, 1195.

³⁵ See, e.g., *Estee Lauder Inc. v. L’Oreal, S.A.*, 129 F.3d 588, 593 (Fed. Cir. 1997) (stressing the importance of testing a skincare product to determine whether or not it actually works “for its intended purpose”).

³⁶ See, e.g., *Dawson v. Dawson*, 710 F.3d 1347, 1356 (Fed. Cir. 2013) (holding that conception requires “that the inventor know how his definite and permanent idea of the *complete and operative invention* . . . is hereafter to be applied in practice” (emphasis added) (internal quotation marks omitted)).

³⁷ See, e.g., *Burroughs Wellcome Co. v. Barr Labs., Inc.*, 40 F.3d 1223, 1228 (Fed. Cir. 1994) (“[A]n inventor need not know that his invention will work for conception to be complete. He need only show that he had the idea; the discovery that an invention actually works is part of its reduction to practice.” (citation omitted)).

³⁸ *Dawson*, 710 F.3d at 1356 (“[P]art of the conception inquiry asks whether the inventor ‘possess[ed] an operative method of making [the invention].’” (quoting *Invitrogen Corp. v. Clontech Labs., Inc.*, 429 F.3d 1052, 1063 (Fed. Cir. 2005))).

be the first inventor, the courts are to consider both the respective dates of conception and reduction to practice, as well as the diligence of someone who is first to conceive and last to reduce to practice.³⁹ Thus, neither conception nor reduction to practice alone determines when someone has invented; invention occurs only once someone has conceived and is at least working diligently towards reduction to practice.

However, the reduction to practice that section 102(g) contemplates is not necessarily a real reduction to practice. The law permits the filing of an enabling patent application to serve as a “constructive” reduction to practice sufficient for priority purposes.⁴⁰ That constructive reduction to practice is given parity with an actual reduction to practice.⁴¹ Put another way, the law of priority doesn’t give any preference to inventors who actually build and test a device over those who merely write a patent application describing their conception. To the contrary: if you choose to constructively reduce your invention to practice, you don’t need to show that you know the invention will work for its intended purpose.⁴² So, in an important class of cases—where an inventor has an idea of an invention but isn’t yet sure if it will work, these “paper patentees”⁴³ are more likely to win a priority contest than those who wait to build and test their invention before filing.

To be sure, the patent application must be enabling: it must teach a person having ordinary skill in the art enough so that she could make and use the invention without “undue experimentation.”⁴⁴ But the courts have permitted applications that require a fair amount of experimentation without invalidating

³⁹ 35 U.S.C. § 102(g) (2000).

⁴⁰ See, e.g., *In re Lundak*, 773 F.2d 1216, 1223 (Fed. Cir. 1985) (holding that “constructive” reduction to practice is satisfied upon filing an enabling patent application).

⁴¹ *Cotropia*, *supra* note 16, at 73 (“Patent law has long recognized a legal fiction that substitutes for actual reduction to practice—constructive reduction to practice.”).

⁴² In *Robotic Vision Systems, Inc. v. View Engineering, Inc.*, 249 F.3d 1307 (Fed. Cir. 2001), the court held that an invention was ready for patenting despite evidence that “one of the inventors [had] expressed skepticism as to whether the invention would work for its intended purpose.” *Id.* at 1310. The court reasoned that “[i]t will be a rare case indeed in which an inventor has no uncertainty concerning the workability of his invention before he has reduced it to practice. No such requirement will be applied here.” *Id.* at 1312. See also *Pfaff v. Wells Electronics, Inc.*, 525 U.S. 55, 66-68 (1998), in which the Court held that an invention was ready for patenting before the patentee built it. By contrast, if the idea is so unformed that the patentee cannot describe it in an enabling way, it is not ready for patenting. See, e.g., *Space Systems/Loral, Inc. v. Lockheed Martin Corp.*, 271 F.3d 1076, 1080 (Fed. Cir. 2001) (“The fact that a concept is eventually shown to be workable does not retrospectively convert the concept into one that was ‘ready for patenting’ at the time of conception.”).

⁴³ Mark A. Lemley, *Ex Ante Versus Ex Post Justifications for Intellectual Property*, 71 U. CHI. L. REV. 129, 137 (2004). For a discussion of paper patentees and their historic treatment in the law, see generally Duffy, *supra* note 5.

⁴⁴ *In re Wands*, 858 F.2d 731, 736 (Fed. Cir. 1988).

a patent claim on enablement grounds.⁴⁵ And part of “due” experimentation can involve figuring out that the invention actually works.⁴⁶ When an applicant has an idea but no way of knowing whether that idea works, courts have permitted him to use “prophetic examples,” which are essentially guesses as to what would happen if he were to build and test his invention.⁴⁷ If that guess turns out to be reasonably accurate, the paper patentee gets credit for teaching others how to make and use the invention even though she never did so herself.⁴⁸

The result is to disadvantage inventors who actually build and test their inventions before filing a patent application. An inventor is better off filing a patent application as early as possible, before—or perhaps instead of—building a prototype or testing the invention.⁴⁹ An inventor who waits to build and test a prototype can qualify as the first inventor even if someone else files an application first, but only if the inventor can show that she was diligent in reducing the invention to practice.⁵⁰ The test for diligence is quite strict, requiring continuous acts to build and test the invention.⁵¹ Inventors have lost their claims because they spent even a week or two doing something other than building their inventions. So diligence is unlikely to provide much of a counterweight.⁵² As against the inventor who went straight to the patent office, those who seek to build and test their inventions are at a disadvantage.

⁴⁵ See *id.* at 739. The cases center on whether experimentation is “undue,” meaning that a patent is not enabling if it requires excessive experimentation. *Wyeth & Cordis Corp. v. Abbott Labs.*, 720 F.3d 1380, 1384 (Fed. Cir. 2013).

⁴⁶ *Robotic Vision*, 249 F.3d at 1312 (contending that an enabling disclosure was sufficient even though it “demonstrated that more work was needed to determine whether the invention would work for its intended purpose”); *Burroughs Wellcome Co. v. Barr Labs., Inc.*, 40 F.3d 1223, 1231 (Fed. Cir. 1994) (“The question is not whether [the inventor] reasonably believed that the inventions would work for their intended purpose . . . but whether the inventors had formed the idea of their use for that purpose in sufficiently final form that only the exercise of ordinary skill remained to reduce it to practice.”).

⁴⁷ See, e.g., *Atlas Powder Co. v. E.I. du Pont De Nemours & Co.*, 750 F.2d 1569, 1577 (Fed. Cir. 1984).

⁴⁸ Of course, it is always possible that such a prophecy will turn out to be wrong—that the invention won’t work as predicted. But, if so, the patent generally will not turn out to be particularly valuable, whether or not it was tested first. Indeed, such a patent should be invalid for lack of utility as well as lack of enablement.

⁴⁹ *Merges & Nelson*, *supra* note 7, at 879 (“In its grant of priority to the first to invent; its preference for an early reduction to practice; and its provisions designed to encourage early filing of patent applications, patent law favors not just invention, but *early* invention.” (footnotes omitted)).

⁵⁰ 35 U.S.C. § 102(g) (2000).

⁵¹ See, e.g., *Griffith v. Kanamaru*, 816 F.2d 624, 628-29 (Fed. Cir. 1987).

⁵² Professor Colleen Chien and I have found that only 10% of interference cases are decided on diligence grounds, and of those cases, only 2.5% found for the junior filer based

Those who actually build prototypes are disadvantaged in a second way under the 1952 Act. The “on sale” bar applies to those who sell the actual physical embodiment of the invention, but not to those who sell or license the idea of the invention itself.⁵³ The Supreme Court expanded the doctrine somewhat to include those who put the invention on sale before they have actually built a prototype, but even then it is only the sale of the working invention itself, not the sale of the idea for the invention, that can trigger the one-year bar date for patenting.⁵⁴ There are decent reasons not to force those who are seeking to sell an idea to obtain a patent before they know whether the idea is worth anything.⁵⁵ But the fact remains that if you sell an idea committed to paper alone, the law will treat you more favorably than if you sell a prototype along with your idea.

II. THE AIA AND THE MOVE AWAY FROM CONSTRUCTION AND TESTING

The 1952 Act, then, put a thumb on the scale in favor of filing a patent application early rather than first waiting to build something. In 2011, Congress enacted the AIA, the most substantial overhaul of the patent system in the past sixty years.⁵⁶ The AIA does even more than the 1952 Act to encourage early filing.

The most significant change in the AIA was the move from a first-to-invent regime to a first-inventor-to-file regime.⁵⁷ Before 2013, U.S. patent law chose among competing claimants to a patent by favoring the first to invent.⁵⁸ Under

on their diligence in reducing to practice. Mark A. Lemley & Colleen V. Chien, *Are the U.S. Patent Priority Rules Really Necessary?*, 54 HASTINGS L.J. 1299, 1315 tbl.2 (2003).

⁵³ See, e.g., *Minton v. Nat'l Ass'n of Sec. Dealers, Inc.*, 336 F.3d 1373, 1378 (Fed. Cir. 2003) (finding that transfer of “know-how” of a claimed process was not a sale under § 102(b), but that transfer of an operational computer program that performs the claimed process was); *In re Kollar*, 286 F.3d 1326, 1330-32 (Fed. Cir. 2002) (holding that an inventor’s grant of a license to an invention and transfer of “know-how” of an invention did not trigger § 102(b)’s “on sale” bar).

⁵⁴ *Pfaff v. Wells Elecs., Inc.*, 525 U.S. 55, 60-63 (1998) (finding that marketing of a newly-developed invention did not qualify as putting the invention “on sale” within the meaning of § 102 because the invention hadn’t been reduced to practice).

⁵⁵ For discussion of these issues, see, for example, Timothy R. Holbrook, *The More Things Change, the More They Stay the Same: Implications of Pfaff v. Wells Electronics, Inc. and the Quest for Predictability in the On-Sale Bar*, 15 BERKELEY TECH. L.J. 933, 982-84 (2000).

⁵⁶ Press Release, The White House, Office of the Press Sec’y, President Obama Signs America Invents Act, Overhauling the Patent System to Stimulate Economic Growth, and Announces New Steps to Help Entrepreneurs Create Jobs (Sept. 16, 2011), <https://www.whitehouse.gov/the-press-office/2011/09/16/president-obama-signs-america-invents-act-overhauling-patent-system-stim> [<https://perma.cc/SA3P-ZMUU>].

⁵⁷ *Abrams & Wagner*, *supra* note 12, at 517.

⁵⁸ *Id.* at 519 n.8 (“Different provisions of the new law became effective at different times, ranging from the date of enactment of the AIA on September 16, 2011, until March

the AIA, we (largely) follow the rest of the world in awarding the patent to the first inventor to file a patent application.⁵⁹ The goal of the move to (mostly) first-to-file, besides harmonization, is to encourage inventors to proceed with alacrity to share their invention with the world.⁶⁰ Under the new law, an inventor can't rest on merely having invented; they have to race to the Patent and Trademark Office (PTO) in hopes of beating competitors.⁶¹ Yet the AIA's race to the PTO yields an advantageous result: it incentivizes inventors to promptly disclose their ideas to the public.⁶² And the means of that disclosure is ultimately keyed to the filing of the patent application, not to releasing a product.

The structure of the AIA is not encouraging to those who would build and test their invention before filing a patent application. As we have seen, the 1952 Act gave a patent to the first person to invent, and invention was defined as a hybrid between conception and (actual or constructive) reduction to practice.⁶³ I argued in the last section that the hybrid approach was insufficiently protective of those who chose to build rather than to simply patent. But the AIA replaces the first-to-invent system with a first-to-file priority system.⁶⁴ While a first-to-file system has the advantage of simplicity, eliminating many of the complex rules for priority under the 1952 Act,⁶⁵ it also eliminates any ability for an inventor who waits to file her patent application until after she has perfected the invention to claim priority against a paper patentee who heads straight to the patent office. Under the AIA, no matter who invented first or how good the argument for delaying in order to build and test

16, 2013. The relevant provisions here—the new priority rules—are effective for patent applications filed on or after March 16, 2013.”).

⁵⁹ Portions of this paragraph and the one that follows are adapted from Mark A. Lemley, *Does “Public Use” Mean the Same Thing It Did Last Year?*, 93 TEX. L. REV. 1119, 1119 (2015).

⁶⁰ *Id.* For an empirical analysis of the likely effects of the move, see Abrams & Wagner, *supra* note 12, at 546-50.

⁶¹ Lemley, *supra* note 59, at 1119.

⁶² *Id.* (“Whether it is by filing a (later-published) patent application or by publishing the invention, one of the touted advantages of the AIA is that it will encourage inventors to promptly disclose their ideas to the public.”); see, e.g., Press Release, Office of the Press Sec’y, *supra* note 56 (noting that the purpose of the bill was to help inventors bring their ideas to market more quickly).

⁶³ See *supra* Part I.

⁶⁴ See Abrams & Wagner, *supra* note 12, at 519.

⁶⁵ See Lemley & Chien, *supra* note 52, at 1331-33; Gerald J. Mossinghoff, *The U.S. First-to-Invent System Has Provided No Advantage to Small Entities*, 88 J. PAT. & TRADEMARK OFF. SOC’Y 425, 425 (2002) (explaining that the U.S. first-to-invent system operated “under an arcane and burdensome complex of substantive and procedural rules and regulations governing what are called ‘interferences’ in the U.S. Patent and Trademark Office”).

the invention, the inventor who arrives at the patent office second loses.⁶⁶ Put another way, while the 1952 Act didn't give enough encouragement to build and test, the AIA gives none at all.

The AIA may make it more difficult to build and test the invention in another way. There is one doctrine in pre-AIA case law that encourages inventors to build and test inventions before filing for a patent: the experimental use doctrine. The 1952 Act requires that an inventor file a patent application within one year after engaging in a public use or a sale of the invention.⁶⁷ The experimental use doctrine stops the clock running if the inventor can show that her sale or public use was part of an effort to experiment on the invention, thereby reducing it to practice and making sure it works for its intended purpose.⁶⁸ While patent law normally bars a patent if the invention has been on sale or in public use for more than a year, the experimental use defense allows an inventor to extend that period by selling or using her invention herself for purposes of experiment.⁶⁹ But only the

⁶⁶ 35 U.S.C. § 102(a)(2) (2012). There is a limited exception for those who publicly disclose their invention before anyone else applies for a patent, which I discuss below.

⁶⁷ *Id.* § 102(b).

⁶⁸ *See, e.g., Pfaff v. Wells Elecs., Inc.*, 525 U.S. 55, 64 (1998) (“[A]n inventor who seeks to perfect his discovery may conduct extensive testing without losing his right to obtain a patent . . . even if such testing occurs in the public eye.”). There is a fact-specific, multifactor test to determine whether a particular use or sale is in fact an experiment. *See, e.g., Monon Corp. v. Stoughton Trailers, Inc.*, 239 F.3d 1253, 1258-61 (Fed. Cir. 2001); *Lough v. Brunswick Corp.*, 86 F.3d 1113, 1121 (Fed. Cir. 1996); *Baker Oil Tools, Inc. v. Geo Vann, Inc.*, 828 F.2d 1558, 1564 (Fed. Cir. 1987) (“In determining whether a public use or sale was under circumstances ‘substantially for purposes of experiment,’ courts have considered various factors, such as the necessity for the public testing, the amount of control retained over the operation, the extent of public testing in relation to the nature of the invention, the length of the test period, whether any payment was made, whether there was a secrecy obligation, whether progress records were kept, who conducted the experiments, and the degree of commercial exploitation during the tests in relation to the purpose of the experimentation.”). For a detailed discussion of the multifactor test, see, for example, Shashank Upadhye, *To Use or Not to Use: Reforming Patent Infringement, the Public Use Bar, and the Experimental Use Doctrine as Applied to Clinical Testing of Pharmaceutical and Medical Device Inventions*, 4 MINN. INTELL. PROP. REV. 1, 12-50 (2002). The Federal Circuit has sometimes spoken of the experimental use doctrine as simply part of the public use inquiry, but it has done so in order to align the burden of proof. *See TP Labs., Inc. v. Prof'l Positioners, Inc.*, 724 F.2d 965, 971 (Fed. Cir. 1984). However, the two questions are analytically distinct. One asks whether a use was reasonably accessible to the public; the other asks whether that use should nonetheless not trigger the one-year clock because it was done for experimental purposes. Upadhye, *supra*, at 52. Not all experiments are public, and not all public uses are experiments.

⁶⁹ *Elizabeth v. Pavement Co.*, 97 U.S. 126, 133-37 (1877) (finding experimental use where an inventor had placed his invention in public use for six years but where he had “constructed the pavement in question by way of experiment, for the purpose of testing its qualities”).

inventor's uses or those she licenses are excused; a third party's sale or public use of the same invention will start the one-year clock running.⁷⁰

Does experimental use survive the AIA? The new statutory framework suggests that what the inventor does between conception and reduction to practice doesn't matter, but also won't prevent another inventor from patenting first. The inventor's own *public* disclosures in printed publications will bar others from getting a patent if they didn't file or disclose first.⁷¹ Those public disclosures will preserve the inventor's right to later file for a patent, but only for a year.⁷² The inventor's own sales and uses of the invention will not bar her from getting a patent, but only for a year.⁷³ One question is whether proof of experimental use extends those one-year bar dates. I have argued elsewhere that the experimental use doctrine should survive into the AIA, allowing inventors who are engaged in experimentation to sell or use their inventions in public for more than a year without barring themselves from later getting a patent.⁷⁴ But others have argued that the term "public use" should be interpreted anew even though it was carried over from the old statute, and that the new "public use" language should not incorporate the common law interpretations of the old "public use" language.⁷⁵ The PTO originally took a position of neutrality, suggesting it was an open question whether the experimental use doctrine survived into the AIA, but now seems to think experimental use does not survive at all.⁷⁶ Without an experimental use

⁷⁰ See Upadhye, *supra* note 68, at 31 ("The experimenters maintain integrity by doing the experiments themselves or maintaining adequate control over third party facilitators.").

⁷¹ 35 U.S.C. § 102(a)(1) (2012).

⁷² Alan Devlin, *The Misunderstood Function of Disclosure in Patent Law*, 23 HARV. J.L. & TECH. 401, 429 (2010).

⁷³ 35 U.S.C. § 102(b)(1)(A)-(B) (2012).

⁷⁴ Lemley, *supra* note 59, at 1135-36.

⁷⁵ See, e.g., Robert A. Armitage, *Understanding the America Invents Act and Its Implications for Patenting*, 40 AIPLA Q.J. 1, 51-60 (2012) (asserting that the new Act would make it so that "[a]n inventor's confidential sale of his invention, his demonstration of its use to a private group, or a third party's unrestricted but private use of the invention will no longer constitute prior art"); Joe Matal, *A Guide to the Legislative History of the America Invents Act: Part I of II*, 21 FED. CIR. B.J. 435, 466-74 (2012) (arguing that the AIA excluded secret commercial uses, based largely on Senator Kyl's statements on the Senate floor).

⁷⁶ The PTO released examination guidelines under the AIA. See generally Examination Guidelines for Implementing the First Inventor to File Provisions of the Leahy-Smith America Invents Act, 78 Fed. Reg. 11,059 (Feb. 14, 2013). Comment 12 addresses the issue of the experimental use exception to public use, and whether the exception remains viable under the AIA. *Id.* at 11,063. According to the PTO, "[u]nder pre-AIA case law, the experimental use exception negates a use that would otherwise defeat patentability. Neither the AIA nor its legislative history expressly addresses whether the experimental use exception applies to a public use under AIA 35 U.S.C. 102(a)(1), or to a use that makes the invention available to the public under the residual clause of AIA 35 U.S.C. 102(a)(1).

exemption, inventors who actually build and test their inventions will be at a substantial disadvantage if deploying and testing requires the participation of outsiders, as is often the case with software inventions and a variety of inventions intended for widespread public use.

Even if the experimental use doctrine survives into the AIA, it may offer less protection to implementers than it once did. The AIA retains the one-year grace period to file an application that is present in the 1952 Act. But the structure of the grace period is different. The grace period in the 1952 Act was absolute: no conduct by any party after an inventor had invented could bar that inventor from getting a patent within a year after a public disclosure, sale, or use. And the experimental use doctrine allowed the patentee to extend that one-year grace period for their own sales and uses, though not sales or uses by unrelated third parties.⁷⁷ By contrast, the absolute one-year grace period under the AIA does not apply to all disclosures, but only to the subset of “public disclosures.” Section 102(b) reads:

(b) EXCEPTIONS.—

(1) DISCLOSURES MADE 1 YEAR OR LESS BEFORE THE EFFECTIVE FILING DATE OF THE CLAIMED INVENTION.—A disclosure made 1 year or less before the effective filing date of a claimed invention shall not be prior art to the claimed invention under subsection (a)(1) if—

(A) the disclosure was made by the inventor or joint inventor or by another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

Because this doctrine arises infrequently before the [PTO], and is case-specific when it does arise, the [PTO] will approach this issue when it arises on the facts presented.” *Id.* The PTO’s Manual of Patent Examining Procedure, by contrast, now instructs examiners not to apply the experimental use doctrine. U.S. PATENT & TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE § 2133.03(3) (9th ed. Nov. 2015) (stipulating that the Pre-AIA 35 U.S.C. § 102 “is *not applicable* to applications subject to examination under the first inventor to file (FITF) provisions of the AIA . . .”).

⁷⁷ See, e.g., *Eolas Techs. Inc. v. Microsoft Corp.*, 399 F.3d 1325, 1334 (Fed. Cir. 2005) (“[T]hird party prior use accessible to the public is a section 102(b) bar.”). While one inventor can avoid a bar by showing that her sale or public use was experimental, that same sale will start the clock running for everyone else, even if the use was not practically accessible to anyone else. See *Baxter Int’l, Inc. v. COBE Labs., Inc.*, 88 F.3d 1054, 1056, 1061 (Fed. Cir. 1996) (invalidating a patent based on prior public use by a third party where the third party had no “relationship or connection” with the patentee and the testing was not known to the patentee). *But cf.* *Delano Farms Co. v. Cal. Table Grape Comm’n*, 778 F.3d 1243, 1247-50 (Fed. Cir. 2015) (holding that two farmers who grew the patentee’s grapes without permission did not create a public use because they were bound to an implied confidentiality agreement). The result is a potential paradox: if two independent inventors both experiment on the invention at the same time in an effort to reduce it to practice, each inventor’s experimental public use will bar the other from getting a patent.

(B) the subject matter disclosed had, before such disclosure, been *publicly disclosed by the inventor* or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor.⁷⁸

Thus, while a third party's conduct within the one-year grace period could not bar an inventor from getting a patent under the 1952 Act, that is no longer true under the AIA. If the inventor "discloses" but does not "publicly disclose" the invention, independent disclosures by a third party even after the inventor's disclosure can still bar her patent.⁷⁹ For instance, if an inventor makes a few non-public sales of the invention to beta-testers, those sales will not themselves bar her from filing a patent for a year, and perhaps longer if they are part of a bona fide experimental use. But independent sales or uses by a third party during that year *will* bar her from obtaining a patent even if she was engaged in experimentation.⁸⁰

I have written elsewhere on the uncertainty over what constitutes a disclosure but not a "public disclosure" under the AIA.⁸¹ However that debate is resolved, some things—most likely noncommercial uses and non-public sales of the invention—will count as prior art that triggers the provisions of the AIA but will *not* count as public disclosures sufficient to trigger the absolute protection of the one-year grace period. And those very things—secret, noncommercial uses and non-public sales to a few buyers—are the very sorts of activities that are most likely to be consistent with true experimentation. An inventor who builds and wants to test her invention will need to use it, and perhaps enlist others to use it, to be sure that it works for its intended purpose. But in doing so, she may unwittingly open the door to third party conduct that will prevent her from getting a patent once she determines that the invention does work. The inventor could, perhaps, publicly disclose the experiment while it is going on to hedge against the risk that someone else will beat her to the patent office. But even that will only buy her a year in which to experiment.

Patent law, then, has always put a thumb on the scale in favor of patenting first and figuring out later if the invention will actually work. But, with the AIA, that thumb has become a fist, weighing heavily against actually building and testing an invention before heading to the patent office.

⁷⁸ 35 U.S.C. § 102(b)(1) (2012) (emphasis added).

⁷⁹ *Id.* § 102(b)(1)(B).

⁸⁰ By contrast, if the third party got the idea from the inventor, that third party's conduct cannot bar the inventor's entitlement to a patent during the one-year grace period. *Id.* § 102(b)(1)(A).

⁸¹ Lemley, *supra* note 59, at 1123-26 (contrasting patent law's traditional understanding of "disclosures" as "anything that qualifies as a prior art reference" with the PTO's narrower interpretation of the AIA); see also Robert P. Merges, *Priority and Novelty Under the AIA*, 27 BERKELEY TECH. L.J. 1023, 1038-42 (2012) (arguing that "public disclosure" must mean something different than simply "disclosure" in § 102).

III. TOWARDS (SOME) PARITY FOR BUILDERS

A. *The Problem with Early Filing*

Favoring early filing over actually building and testing the invention is probably a mistake. Chris Cotropia has explained well what he calls the “folly of early filing” of patents:

Filing early and often exacerbates many of the patent system’s most recognized problems. It adds significantly to the ever-rising number of applications, contributing to the backlog and burden on the United States Patent and Trademark Office (USPTO) that reduces the quality of examination and issued patents. More applications means more issued patents, which cause problems of their own, particularly if they are “bad” patents. The earlier patents are filed, the more likely they go undeveloped. Commercialization does not occur because of the great uncertainty and the minimal investment at the time of filing. Asserting an early-filed patent is a cheaper alternative to commercialization. This low-cost option entices patent trolls who use patents solely to extract rents from those engaged in commercial development. The dearth of information and the great uncertainty at the time of filing also contributes to the lack of clarity in the patent’s specification and claims, causing patent boundaries to be unclear.⁸²

Cotropia makes a strong case. True, there are some advantages to society from early filing. A patent application that is filed earlier will, all other things being equal, result in a patent that expires earlier, releasing that invention into the public domain.⁸³ And, as I have observed elsewhere, we don’t want inventors to deliberately delay filing (and hence expiration) while taking commercial advantage of the invention.⁸⁴

Other purported advantages turn out to be illusory, however. While patent law may encourage racing to a new invention, as I have argued,⁸⁵ that begs the

⁸² Cotropia, *supra* note 16, at 70 (footnotes omitted).

⁸³ John F. Duffy, *Rethinking the Prospect Theory of Patents*, 71 U. CHI. L. REV. 439, 440-44 (2004). Since 1995, patents normally expire twenty years after the filing date. 35 U.S.C. § 154(a)(2) (2012). But that term can be extended for a variety of reasons. *Id.* § 154(b). Even before 1995, when patents lasted seventeen years from the date of issue, early filing normally meant earlier issuance and therefore earlier expiration.

⁸⁴ Lemley, *supra* note 59, at 1131-32 (explaining that preventing inventors from commercializing their inventions while delaying filing for patents is “an important policy that underlies the statutory bars in patent law”).

⁸⁵ Lemley, *supra* note 24, at 749-57 (“While patents don’t seem to be encouraging the development of discrete new ideas that no one else has, that doesn’t mean they aren’t motivating innovation at all. Rather, it means that the simple incentive-to-invent story must be complicated by the presence of competitors working to achieve the same invention at roughly the same time. Granting a patent to the first to achieve that goal doesn’t just encourage one entrant; it may have a more complex set of incentives for different

question of to what end inventors are racing. We might be better off having inventors race to build something than simply race to come up with new ideas first. Patent disclosure theory is premised on the idea that the patent document teaches the world how to make and use the invention.⁸⁶ In fact, however, patents rarely provide much in the way of useful scientific knowledge in most industries;⁸⁷ scientists who are doing research tend to look elsewhere than patents for their learning.⁸⁸ And that is likely to be even more true of patents filed by those who never made a product, since those patents will lack the level of technical detail and experimental results that an inventor who has actually constructed and tested a prototype can offer.

B. *Should We Eliminate Paper Patents?*

Cotropia would restore parity between those who build the invention and those who do not by the simple expedient of barring the latter from getting a patent.⁸⁹ While he would not go as far as those who would require

participants depending on how they perceive themselves relative to their competitors. The incentives provided by a patent, in other words, must be filtered through the realities of a patent race.”).

⁸⁶ See *id.* at 745 (“The benefit the public gets from the bargain . . . is not (or not just) a new invention but the publication of new learning that might otherwise have been kept secret.”); Mark A. Lemley & Robin Feldman, *Patent Licensing, Technology Transfer, and Innovation*, 106 AM. ECON. REV. (forthcoming 2016).

⁸⁷ Devlin, *supra* note 72, at 403 (“[T]he extent to which patent documents successfully teach the inner workings of cutting-edge technologies is quite limited. The information conveyed by many specifications is inadequate and, in practice, fails to reflect the legislative requirements of § 112. Indeed, a minority of patents do not convey meaningful information of any kind. Patents in the information technology (“IT”) industry are perhaps the worst offenders, being notorious for their vague language.” (footnotes omitted)); Lemley, *supra* note 24, at 744-48; Note, *The Disclosure Function of the Patent System (or Lack Thereof)*, 118 HARV. L. REV. 2007, 2025-26 (2005); see also Jeanne C. Fromer, *Patent Disclosure*, 94 IOWA L. REV. 539, 542 (2009).

⁸⁸ I often ask the former scientists and engineers in my patent class whether they ever read patents as a way of doing scientific background reading. The question provokes a chorus of denials and giggles at the very idea.

That said, the value of patents as disclosure tools may differ from industry to industry, and some types of scientists may read patents, as Professor Lisa Ouellette has suggested. Lisa Larrimore Ouellette, *Do Patents Disclose Useful Information?*, 25 HARV. J.L. & TECH. 545, 566-74 (2012) (comparing patent reading between industrial researchers and nanotechnology researchers); see also John M. Golden, *Principles for Patent Remedies*, 88 TEX. L. REV. 505, 521-22 (2010) (citing a survey that found that approximately a third of “biotechnology and venture-backed information-technology hardware companies identified information disclosure as the number-one reason not to obtain patent rights”). Patents may also encourage the sort of disclosures that *do* communicate information, for example by giving scientists at companies the comfort necessary to present their work at conferences. For a discussion of this sort of indirect learning, see Lemley, *supra* note 24, at 747.

⁸⁹ Cotropia, *supra* note 16, at 71.

commercialization of the invention,⁹⁰ he would require proof of actual, not constructive, reduction to practice before filing a patent application.⁹¹ For Cotropia, as for Justice Story, it is the delivery of a working product, or at least a prototype, that is worthy of patent protection.⁹²

I have some sympathy for Cotropia's position, and I think we need to do more to encourage—or at least not disadvantage—those who choose to build and test a prototype. But requiring actual reduction to practice probably goes too far. In some fields, such as semiconductor manufacturing, designers may not be able to actually build and test their inventions without a great deal of time and money—money that inventors may not be able to pay. Patents have allowed vertical disintegration in that industry, permitting independent design firms to produce and sell designs to semiconductor manufacturers.⁹³ Other inventors, particularly those associated with universities, may not be well-positioned to build and test their inventions, preferring instead to partner with outside firms to do the development.⁹⁴ And patents can sometimes facilitate

⁹⁰ See, e.g., Yosick, *supra* note 15, at 1287-88 (advocating for a patenting system like those in certain foreign countries where governments can “revoke or limit a previously granted exclusive patent right” when “the patent is not being worked”); Posner, *supra* note 15 (suggesting that “[w]e could make the granting of a patent contingent on producing the product or process that incorporated the invention, within a specified time”); cf. Ted Sichelman, *Commercializing Patents*, 62 STAN. L. REV. 341, 395 (2010) (arguing, not for a commercialization requirement for patentability, but for separate patents to encourage commercialization).

⁹¹ Cotropia, *supra* note 16, at 120 (arguing that constructive reduction should be abolished because a strictly non-constructive reduction requirement “generates more technical information about the invention prior to patent issuance, moves the inventor further down the development path before examination, and gives the inventor a clearer picture of the possible commercial value of the invention prior to patenting”).

⁹² *Id.* at 128 (“The basic goal of the patent system is the production of socially beneficial technology. That is, technology that society can actually use.”).

⁹³ See, e.g., Barnett, *supra* note 33, at 792 (highlighting the “important role that patents appear to play in the widespread disintegration of supply chains in technology markets that had formerly been dominated by vertically integrated firms”); Jonathan M. Barnett, *Property as Process: How Innovation Markets Select Innovation Regimes*, 119 YALE L.J. 384, 450 (2009); Bronwyn H. Hall & Rosemarie Ham Ziedonis, *The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979-1995*, 32 RAND J. ECON. 101, 125 (2001) (finding that strong patents in the semiconductor industry support the creation of design firms vertically disintegrated from manufacturing).

⁹⁴ For a discussion of university patenting and technology transfer, see, for example, DAVID C. MOWERY ET AL., *IVORY TOWER AND INDUSTRIAL INNOVATION: UNIVERSITY-INDUSTRY TECHNOLOGY TRANSFER BEFORE AND AFTER THE BAYH-DOLE ACT 152-78* (2004) (outlining five case studies exploring the technology transfer process at universities); Mark A. Lemley, *Are Universities Patent Trolls?*, 18 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 611, 611 (2008) (“University technology transfer ought to have as its goal maximizing the social impact of technology, not merely maximizing the university’s licensing revenue.”).

that process of technology transfer.⁹⁵ And even if the record of patents actually driving rather than following technology transfer is a mixed one, it would surely be desirable to move towards a patent system in which people with good ideas could sell those ideas to companies who could make use of them.⁹⁶ Requiring all inventors to build their own products would be a step away from that idea.

Further, while Cotropia is right that those who do not develop and test their invention are less likely to see it commercialized and more likely to become patent trolls,⁹⁷ there are plenty of examples of product-producing companies

⁹⁵ See *supra* note 14. There is substantial literature on patents as a way out of Arrow's paradox. See, e.g., James J. Anton & Dennis A. Yao, *Expropriation and Inventions: Appropriate Rents in the Absence of Property Rights*, 84 AM. ECON. REV. 190, 190-92 (1994); Paul J. Heald, *Transaction Costs and Patent Reform*, 23 SANTA CLARA COMPUTER & HIGH TECH. L.J. 447, 453-54 (2007); Robert P. Merges, *Intellectual Property and the Costs of Commercial Exchange: A Review Essay*, 93 MICH. L. REV. 1570, 1590-91 (1995) (noting the importance of contract law in intellectual property exchanges); Robert P. Merges, *A Transactional View of Property Rights*, 20 BERKELEY TECH. L.J. 1477, 1489-1502 (2005); cf. Michael J. Burstein, *Exchanging Information Without Intellectual Property*, 91 TEX. L. REV. 227, 258-74 (2012) (arguing that we don't need patents to solve Arrow's Information Paradox because structured disclosure of information and various other appropriability mechanisms can enable contracting); Mark A. Lemley, *The Surprising Virtues of Treating Trade Secrets as IP Rights*, 61 STAN. L. REV. 311, 314 (2008) (arguing that trade secrets can serve the same purpose without patents).

By contrast, efforts to license the patent itself rather than the underlying ideas rarely seem to drive technology transfer. See Robin Feldman & Mark A. Lemley, *Do Patent Licensing Demands Mean Innovation?*, 101 IOWA L. REV. 137, 160-67 (2015) (surveying those involved in patent licensing and finding that efforts to license patents themselves rarely led to technology transfer or innovation, even from universities).

Cotropia suggests that an inventor might file an application early but defer examination until she succeeds in reducing the invention to practice. Cotropia, *supra* note 16, at 121. In so doing, he hopes to solve Arrow's Information Paradox by providing an inchoate right to contract over while conditioning the actual patent grant on successful completion of the reduction to practice. *Id.* at 121-22 (theorizing that if an inventor does not reduce her idea to practice within a certain period, her patent application will be deemed abandoned). While it is an admirable effort, I'm not sure it will provide much more certainty than trade secret rights that already allow contracting for ideas. Burstein, *supra*, at 273 ("Trade secrecy is the most likely candidate to replicate the functions of intellectual property, especially insofar as it grants certain limited entitlements to the holders of information that cannot be protected through conventional patent or copyright."); Lemley, *supra* note 14, at 329-30 (explaining that "[t]rade secrecy . . . gives the developer of new and valuable information the right to restrict others from using it, and therefore the prospect of deriving supracompetitive profits from the information"). And it will create a host of new problems, from delaying the issuance of patents to reopening the question of who has invented a patent conceived by one company but reduced to practice by another.

⁹⁶ See Mark A. Lemley & Nathan Myhrvold, *How to Make a Patent Market*, 36 HOFSTRA L. REV. 257, 257 (2007).

⁹⁷ Cotropia, *supra* note 16, at 113-16.

who ultimately become trolls or sell their patents to trolls.⁹⁸ The troll problem is more systemic than just allowing patents on ideas that never made it to fruition,⁹⁹ though Cotropia is surely right that that is part of the problem.

Finally, and most practically, even if it were a good idea to require reduction to practice, it is unlikely to happen. The AIA represents a significant step in the opposite direction, toward encouraging early filing divorced from commercialization or actual reduction to practice.¹⁰⁰ Congress took that step partly in an effort to harmonize U.S. law with the rest of the world, which does not have such a requirement.¹⁰¹ Universities, which have had an outsized influence on the terms of the patent reform debate, would doubtless resist such a move.¹⁰² And technology is moving away from integrated design and construction toward computer prototyping. The rise of 3D printing will make

⁹⁸ Tom Ewing, *Indirect Exploitation of Intellectual Property Rights by Corporations and Investors: IP Privateering and Modern Letters of Marque and Reprisal*, 4 HASTINGS SCI. & TECH. L.J. 1, 5 (2012) (defining IP privateering); Mark A. Lemley & A. Douglas Melamed, *Missing the Forest for the Trolls*, 113 COLUM. L. REV. 2117, 2137 (2013) (describing “the recent rise of patent privateers—product-producing companies that spin off patents or ally with trolls to target other firms with lawsuits”).

⁹⁹ Lemley & Melamed, *supra* note 98, at 2121 (explaining the alternative concern that “many of the problems associated with trolls are in fact problems that stem from the disaggregation of complementary patents (patents that cover technologies used together in the same products) into too many different hands”); cf. Brian J. Love, *An Empirical Study of Patent Litigation Timing: Could a Patent Term Reduction Decimate Trolls Without Harming Innovators?*, 161 U. PA. L. REV. 1309, 1312 (2013) (finding that patent trolls overwhelmingly assert patents at the end of their term, while product-producing companies assert patents earlier).

¹⁰⁰ Lemley, *supra* note 59, at 1123; see, e.g., Press Release, Office of the Press Sec’y, *supra* note 56 (“I am pleased to sign the America Invents Act. This much-needed reform will speed up the patent process so that innovators and entrepreneurs can turn a new invention into a business as quickly as possible”); cf. Abrams & Wagner, *supra* note 12, at 520 (finding that a move to first to file may discourage individual inventors from filing because of concerns about a race to the PTO).

¹⁰¹ Lemley, *supra* note 59, at 1119.

¹⁰² One can find a number of examples of university influence in the AIA, from the exemption from prior user rights for university patents, 35 U.S.C. § 273(e)(5) (2012), to the definition of a university as a “micro-entity” that gets to pay fees lower even than those required of individual inventors and other non-profits. *Id.* § 123(d); Neel U. Sukhatme, *Regulatory Monopoly and Differential Pricing in the Market for Patents*, 71 WASH. & LEE L. REV. 1855, 1882 (2014) (explaining that “micro-entities pay only one-quarter of the standard PTO fees”). Senator Dianne Feinstein (D-Cal) stated at a hearing on the AIA that there were a number of great universities in California and that she would vote to do what was in their interest, notwithstanding the prevalence of many great IT and biotech companies in California as well. *Patent Reform in the 111th Congress: Legislation and Recent Court Decisions: Hearing Before the S. Comm. on the Judiciary*, 111th Cong. 19 (2009) (statement of Sen. Dianne Feinstein, Member, S. Comm. on the Judiciary).

that separation even more acute.¹⁰³ It seems implausible that the law will buck that trend and require that inventors produce and test their own inventions.

C. *A Middle Ground?*

If we do not do away with constructive reduction to practice, we still need to confront the problems it creates. One way to do so would be to raise the bar to obtaining such a paper patent. We could, for instance, impose a stricter test for disclosing the invention to the world on an inventor who cannot point to working examples—perhaps requiring her to explain the principles behind her invention if she cannot prove that it works in practice.¹⁰⁴ To some extent the law has been doing this already. The development and extension of the written description doctrine is in part directed at a practice I have called “gun jumping”: rushing to the PTO before spelling out what the invention actually is.¹⁰⁵ Cases like *Ariad Pharmaceuticals, Inc. v. Eli Lilly & Co.*¹⁰⁶ and *University of Rochester v. G.D. Searle & Co.*,¹⁰⁷ for instance, involve “inventors” who identified fruitful areas of research but did not actually hypothesize, much less construct, products. These “inventors” merely sought to lock up the results of research later done by someone else.¹⁰⁸ Strengthening the enablement and written description requirements won’t make paper patenting impossible, but it will nudge inventors toward building and testing their invention first by making it harder to get a patent without doing so.¹⁰⁹

¹⁰³ For discussions of the IP implications of 3D printing, see, for example, Deven R. Desai & Gerard N. Magliocca, *Patents, Meet Napster: 3D Printing and the Digitization of Things*, 102 GEO. L.J. 1691, 1703-13 (2014) (arguing that “3D printing’s effect on copyright and trade dress will be more modest than for patent, but these fields will not escape disruption”); Timothy R. Holbrook & Lucas S. Osborn, *Digital Patent Infringement in an Era of 3D Printing*, 48 U.C. DAVIS L. REV. 1319, 1321-28 (2015); Mark A. Lemley, *IP in a World Without Scarcity*, 90 N.Y.U. L. REV. 460, 474-75 (2015); Lucas S. Osborn, *Of PhDs, Pirates, and the Public: Three-Dimensional Printing Technology and the Arts*, 1 TEX. A&M L. REV. 811, 818-32 (2014); Lucas S. Osborn, *Regulating Three-Dimensional Printing: The Converging Worlds of Bits and Atoms*, 51 SAN DIEGO L. REV. 553, 582-93 (2014) (arguing that 3D printing raises new concerns about the treatment of files created by 3D printers, the legal responsibilities of the intermediaries who deal with such files, and “the normative reaction to 3D printing capabilities”).

¹⁰⁴ I thank Josh Sarnoff for this suggestion.

¹⁰⁵ See Mark A. Lemley et al., *Life After Bilski*, 63 STAN. L. REV. 1315, 1330-31 (2011) (explaining that the prevention of gun jumping is one of the goals of 35 U.S.C. § 112).

¹⁰⁶ 598 F.3d 1336 (Fed. Cir. 2010) (en banc).

¹⁰⁷ 358 F.3d 916 (Fed. Cir. 2004).

¹⁰⁸ *Ariad*, 598 F.3d at 1336; *Univ. of Rochester*, 358 F.3d at 916.

¹⁰⁹ Interestingly, nearly a century ago, courts relied on the paper patent doctrine to invalidate or limit the scope of patents in a number of cases in which the patentee had not actually built anything. Duffy, *supra* note 5, at 1360. They did so in language strikingly reminiscent of today’s debate over patent trolls. See, e.g., *Van Kannel Revolving Door Co. v. General Bronze Corp.*, 77 F.2d 300, 303 (2d Cir. 1935) (rejecting a suit based on an

Strengthening the disclosure doctrines will also tend to narrow the scope of patents issued by the PTO. One concern with early filing is that the very inventors who do not build products will draft the broadest claims, simply because they don't actually know what particular implementations of their idea will work. Meanwhile, those who actually do the work may write more specific—and therefore narrower—claims. A particular example of this problem is functional claiming—claiming to own any technology that solves a particular problem, rather than the particular solution the patentee came up with.¹¹⁰ Functional claiming is endemic in software patents, and is arguably responsible for many of the problems with patenting software.¹¹¹ And many of those claims are from patentees who never actually implemented their ideas.¹¹² While the law properly refuses to limit inventors to the particular embodiments they design, functional claiming goes to the opposite extreme, attempting to lay claim to an entire problem without offering a particular solution.¹¹³ I have argued elsewhere that these functional claims are properly understood as covering not every possible way of solving the problem, but only the ways the patentee actually described in her specification.¹¹⁴ A functional claim that is backed up with specific examples is valid but narrowed to those examples and equivalents thereof.¹¹⁵ A functional claim that is not backed up with specific examples is invalid as indefinite.¹¹⁶ Taking that approach may also encourage

“inoperative paper patent which had no effect on the art and was only brought to light by the plaintiff in an effort to monopolize the field after the defendant had already installed, to the plaintiff's knowledge, a [product] of the type now charged to infringe”). For a discussion of the use of the paper patent doctrine, and the ways in which it could benefit as well as harm patentees, see Duffy, *supra* note 5, at 1374-82.

¹¹⁰ See Mark A. Lemley, *Software Patents and the Return of Functional Claiming*, 2013 WIS. L. REV. 905, 907.

¹¹¹ *Id.* at 907-08. Functional claiming is not limited to software, however. For criticism of functional claiming in biotechnology, see *Abbvie Deutschland GmbH & Co. v. Janssen Biotech, Inc.*, 759 F.3d 1285, 1299-1300 (Fed. Cir. 2014).

¹¹² See Lemley, *supra* note 110, at 939.

¹¹³ See *id.* at 905 (explaining functional claiming as “claiming to own not a particular machine, or even a particular series of steps for achieving a goal, but the goal itself”).

¹¹⁴ *Id.* at 916-19 (“To take an example, suppose that the patent claim includes as an element a ‘means for processing data.’ Read literally, without reference to Section 112(f), this language would encompass any possible means for processing data, including any computer, but also a calculator, an abacus, pencil and paper, and perhaps even the human brain. Section 112(f) permits the use of such functional language but doesn't permit it to cover any means of performing the data-processing function. Instead, the claim would be limited to the particular ‘means for processing data’ actually described in the patent specification (say, an iPad) ‘and equivalents thereof.’” (footnotes omitted)).

¹¹⁵ 35 U.S.C. § 112(f) (2012).

¹¹⁶ See, e.g., *Function Media, LLC v. Google Inc.*, 708 F.3d 1310, 1318 (Fed. Cir. 2013) (invalidating a patent where patentee disclosed a computer program's function but “no specific algorithm . . . as a mathematical formula, in flow charts, or otherwise” required to accomplish the function); *ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 518-19 (Fed.

inventors to affirmatively build their inventions to provide those examples. At the very least, a paper patentee that gives only “prophetic examples” will be limited to those examples and not entitled to lay claim to whatever solutions actually turn out to work.¹¹⁷ And precisely because the paper patentee has done

Cir. 2012) (finding a patent indefinite where patentee disclosed a general function for generating purchase orders but “no instruction for using a particular piece of hardware, employing a specific source code, or following a particular algorithm”); Noah Sys., Inc. v. Intuit Inc., 675 F.3d 1302, 1312-13 (Fed. Cir. 2012) (explaining that patents are indefinite where they disclose software but do not disclose the algorithms necessary to perform the asserted functions); Ergo Licensing, LLC v. CareFusion 303, Inc., 673 F.3d 1361, 1362, 1365 (Fed. Cir. 2012) (holding a patent indefinite where “[t]he specification merely provides functional language and does not contain any step-by-step process” for performing the function); Typhoon Touch Techs., Inc. v. Dell, Inc., 659 F.3d 1376, 1384-86 (Fed. Cir. 2011) (finding that a means-plus-function software claim required disclosure of the corresponding structure for performing that function in the specification, but that the structure did not need to be described in the form of software code); *In re Aoyama*, 656 F.3d 1293, 1294, 1297-98 (Fed. Cir. 2011) (holding a means-plus-function software patent claim invalid as indefinite for failure to disclose the corresponding algorithm performing that function); Aristocrat Techs. Austl. Pty Ltd. v. Int’l Game Tech., 521 F.3d 1328, 1337-38 (Fed. Cir. 2008) (finding insufficient disclosure where a “patent does not disclose the required algorithm or algorithms, and a person of ordinary skill in the art would not recognize the patent as disclosing any algorithm at all”); WMS Gaming Inc. v. Int’l Game Tech., 184 F.3d 1339, 1349 (Fed. Cir. 1999) (“[T]he disclosed structure is not the general purpose computer, but rather the special purpose computer programmed to perform the disclosed algorithm.”); *cf.* HTC Corp. v. IPCOM GmbH & Co., 667 F.3d 1270, 1272-73 (Fed. Cir. 2012) (remarking that a means-plus-function software claim would have been invalid as indefinite for failure to disclose the algorithm that performed the functions of the software had the defendant not waived the issue).

For a discussion of these cases, see Sharon Barkume & Michael R. Bielski, *Strict Interpretation of 35 U.S.C. § 112: Requires Universities to Examine Their Patenting Methods*, 28 *TOURO L. REV.* 183, 198-205 (2012); Elise S. Edlin, *Computer Claim Disarray: Untangling the Means-Plus-Function Doctrine to Eliminate Impermissible Functional Claiming in Software Patents*, 28 *BERKELEY TECH. L.J.* 417, 419-20 (2013); Christa J. Laser, *A Definite Claim on Claim Indefiniteness: An Empirical Study of Definiteness Cases of the Past Decade with a Focus on the Federal Circuit and the Insolubly Ambiguous Standard*, 10 *CHI.-KENT J. INTELL. PROP.* 25, 37 tbls.6 & 7, 39-41 (2010). Paul Gugliuzza worries that courts may read limits on functional claiming narrowly, allowing patentees to draft around this requirement and still obtain functional claims. Paul R. Gugliuzza, *When Does Invention Occur?*, 96 *B.U. L. REV.* 1223 (2016). Despite the errors of some district courts he identifies, I am confident that the Federal Circuit can identify and limit functional claiming.

¹¹⁷ See also Cotropia, *supra* note 1 (arguing that we should define the invention by reference to what the inventor actually built or described, not what the claims purport to cover).

no testing, those examples may not turn out as prophetic as the inventor imagines.¹¹⁸

A final solution involves offering some protection to inventors who choose to build and test against those who run to the patent office instead. As we saw in Part I, the 1952 Act offered (incomplete) protection to builders by allowing the first inventor to conceive an idea to justify her delay in filing a patent application by showing that she was diligently reducing that invention to practice and testing it. The AIA removed that protection. In its place, the AIA adopted a “prior user right.”¹¹⁹ The prior user right creates a defense for a company that can show that it was already using the invention in a commercial manufacturing process more than a year before a patent owner filed for a patent on that invention.¹²⁰ The prior user right has so far been invoked rarely, likely because the requirement that the company already have implemented the process in its business more than a year before the patentee even files for a patent will rarely be satisfied.¹²¹

A simple way to provide some protection to those who choose to build first and patent later would be to permit them to take advantage of the prior user right. Doing so would require only a modest expansion of the prior user right: extending it not only to companies engaged in “commercial use” of the invention¹²² but to those engaged in bona fide experimental use or efforts to

¹¹⁸ See Jacob S. Sherkow, *Disenabling: Scientific Irreproducibility in Patent Law* (working paper 2015) (arguing that many patents turn out to be based on irreproducible data).

¹¹⁹ 35 U.S.C. § 273 (2012).

¹²⁰ *Id.* § 273(a)(1)-(2). While in many cases, a company’s use will constitute prior art that would bar a later patent, that is not always true. Secret commercial uses, which often occur with process patents, are not “public uses” that can bar a third party from getting a patent even though they can bar the user from getting her own patent. *W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1549-50 (Fed. Cir. 1983) (explaining that an inventor’s secret commercial use of a process would not bar third parties from patenting that same process, but would bar the inventor from patenting the process if he filed over a year after his commercial use); *Metallizing Eng’g Co. v. Kenyon Bearing & Auto Parts Co.*, 153 F.2d 516, 520 (2d Cir. 1946).

¹²¹ In 2012, the PTO conducted a Congressionally-mandated study of the prior user right and found that it was not likely to be particularly disruptive to existing law. U.S. PATENT & TRADEMARK OFFICE, REPORT ON THE PRIOR USER RIGHTS DEFENSE 53 (2012), http://www.uspto.gov/sites/default/files/aia_implementation/20120113-pur_report.pdf [<https://perma.cc/2GQ3-73PF>] (“The prior user rights defense as set forth in the AIA is narrowly tailored and not expected to be asserted frequently in patent litigation. There is no substantial evidence that prior user rights will negatively impact innovation, start-up enterprises, venture capital, small businesses, universities or individual inventors.”). Indeed, as of this writing, the prior user right has not been applied in a reported decision. For a discussion of how the defense seems directed at manufacturing, and hence does not necessarily fit well with software, see Greg R. Vetter, *Are Prior User Rights Good for Software?*, 23 TEX. INTELL. PROP. L.J. 251, 309 (2015).

¹²² 35 U.S.C. § 273(a)(1) (2012).

reduce the invention to practice. Extending prior user rights to those in the process of developing or testing the invention when the patentee files her patent application will not give builders parity with paper patentees; the law will still put a thumb on the scale in favor of filing first and figuring things out later. But it would at least provide some protection to those independent inventors working to give the world not just a good idea, but also the means to make use of that idea.¹²³

IV. CONCLUSION

Both Robinson and Justice Story had a point. We want good ideas, but we also want practical implementations of those ideas. Without both, the patent system cannot serve its constitutional purpose to promote the progress of the useful arts.¹²⁴ Patent law has tilted increasingly towards encouraging ideas at the expense of those who take the time to develop and test their inventions. It is time to shift the balance—not all the way in the other direction, but at least towards middle ground.

¹²³ It is true, as Paul Gugliuzza suggests, that an expanded prior user right and retention of the experimental use defense will make the determination of inventorship a fuzzier standard rather than a bright-line rule. Gugliuzza, *supra* note 116, at 1224. But our legal system has significant experience making judgments of this sort; after all, we have had an experimental use defense for well over 100 years. And while there are costs to uncertainty, I think they are outweighed by the costs of encouraging inventors to stop at patenting rather than build products.

¹²⁴ U.S. CONST., art. I, § 8, cl. 8 (enumerating Congress's power "[t]o promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries").