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The Structural Implications of Inventors' Disclosure Obligations

*Kevin Emerson Collins**

Disclosure theory posits that inventors must disclose knowledge about their inventions and make that knowledge freely available for certain uses during the term of a patent as part of the price that they pay for their exclusive patent rights. This Article identifies an overlooked implication of this disclosure obligation. The availability of disclosed knowledge itself for free public use during the term of a patent means that there must be limits on inventors' rights: inventors must not be allowed to transform the use of disclosed knowledge itself into infringement through strategic claiming. If they could, inventors would, oddly, be able to opt out of their mandatory disclosure obligations. To avoid this result, it is necessary to recognize the structural implications of inventors' disclosure obligations: inventors' exclusive rights must be doctrinally restricted so that inventors cannot privatize through their claims the very uses of disclosed knowledge that they are obligated to publicize through their disclosures. This implication of inventors' disclosure obligations has to date been overlooked because it requires an analysis that examines the intersection of patent law's incentive and disclosure theories, and these two theories have conventionally been examined only in isolation.

In many situations that form the core of the public privilege to use disclosed knowledge itself, contemporary patent law already limits patentees' rights in the ways needed to protect the public privilege. In these situations, recognizing the structural implications of inventors' disclosure obligations would lead to a sorely needed bout of conceptual housekeeping, providing doctrinal coherence that is today absent and thus long-term stability for doctrines that today rest on shaky foundations. However, in other situations that are at the periphery of the public privilege to use disclosed knowledge itself, recognizing the structural implications of patentees' disclosure obligations may influence debates over what restrictions patent law ought to impose on patentees' rights.

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* Professor of Law, Washington University in St. Louis. I thank participants in *Vanderbilt Law Review*'s The Disclosure Function of the Patent System Symposium for their helpful comments.

INTRODUCTION

Patent law is commonly justified by two different theories, either individually or in combination. On the one hand, the incentive theory of patent law posits that patents create incentives for self-interested individuals to produce socially beneficial innovation. Patent claims grant inventors exclusive rights to their claimed inventions for a limited period of time, with the hope of profit tomorrow from those exclusive rights leading individuals to invest in innovation today. On the other hand, disclosure theory posits that patents create social benefits by forcing inventors to disclose knowledge about their inventions and granting the public a privilege to freely use that knowledge in certain ways even before the expiration of the patent.[1] From the moment patent disclosures are published, the public has a privilege to freely engage in activities such as disseminating the disclosed knowledge and employing the disclosed knowledge as an input into the creative cognition that conceives yet further innovation, including both improvements and design-arounds. For convenience,

1. Disclosure theory in patent law is not unitary. Several distinct disclosure theories focus on different mechanisms through which disclosures generate social benefits. *See infra* Part I. The strain of disclosure theory on which this Article focuses is the pre-expiration public-knowledge theory of the disclosure. *See infra* notes 15, 17, and accompanying text. This Article intentionally uses the term "knowledge" in the way that patent-speak often uses the term "information." *See infra* note 89.

these pre-expiration uses of disclosed knowledge to which the public is entitled will be called *uses of disclosed knowledge itself.*

Working at the intersection of patent law's incentive and disclosure theories, this Article brings to light the overlooked, structural implications of inventors' obligations to disclose innovative knowledge. The availability of the disclosed knowledge itself for free public use during the term of a patent under disclosure theory means that there must be limits on the exclusive rights granted to inventors under incentive theory. For an as-of-right public privilege to the use of disclosed knowledge itself to coexist with inventors' exclusive rights to their claimed inventions, inventors must not be able to claim exclusive rights to the use of disclosed knowledge itself. Imagine if patentees could control the public's ability to disseminate the knowledge disclosed in the specification—e.g., by claiming a document representing certain knowledge as their invention—or perform the cognitive processes employing that knowledge to generate further innovation—e.g., by claiming the act of understanding certain knowledge as their invention. If the Patent Act were to grant such exclusive rights to these uses of disclosed knowledge, inventors could, bizarrely, opt out of their disclosure obligations through strategic claiming. To avoid this result, it is necessary to recognize the structural implications of inventors' disclosure obligations: patentees' exclusive rights must be doctrinally restricted so that inventors cannot privatize through their claims the very uses of disclosed knowledge that they are obligated to publicize through their disclosures.[2]

The patent community's oversight of the structural implications of inventors' disclosure obligations is surprising. Over the last half century, the Supreme Court has repeatedly highlighted that the public-knowledge theory of disclosure is an essential part of the congressional design of the Patent Act, identifying the duality of privatizing claims and publicizing disclosures as one of the most important principles shaping the Act's deep structure.[3] Yet the idea

2. These implications are structural in the sense that structural interpretation reveals their statutory basis in the Patent Act. *See infra* notes 57–64 and accompanying text. Both the statutory validity provisions that define the scope of a valid patent claim and the statutory infringement provisions that define the content of patentees' exclusive rights with respect to their claims influence patentees' exclusive rights, and both can be restricted to reflect the structural implications of inventors' disclosure obligations. *See infra* notes 61–62 and accompanying text.

3. *See, e.g.*, Eldred v. Ashcroft, 537 U.S. 186, 216 (2003); J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc., 534 U.S. 124, 142 (2001); Pfaff v. Wells Elecs., Inc., 525 U.S. 55, 63 (1998); Bonito Boats, Inc. v. Thunder Craft Boats, Inc., 489 U.S. 141, 150–51 (1989); Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 480–81 (1974).

that the provisions of the Patent Act establishing what can be patented, as well as what rights patentees have with respect to patented inventions, should be read in light of that structure does not appear in the opinions, casebooks, and treatises that provide the lexicon that undergirds our understanding of patent law. This gap in how we understand patent law needs to be filled by considering the intersection of disclosure and incentive theories, which are more commonly considered either in isolation or in the alternative.

One reason this unexamined gap in disclosure theory has stubbornly persisted can likely be traced to the fact that contemporary patent law already limits patent owners' rights in the ways that are needed to safeguard the core of the public privilege to use knowledge itself prior to patent expiration. Through a doctrinal bricolage of sorts, courts already provide de facto recognition of the structural implications of inventors' disclosure obligations, but they do not provide *de dicto* recognition of those implications in the reasoning that they deploy to explain why the law is the way it is or what the law is doing.[4] For example, the printed matter doctrine forbids claims to texts representing newly created technological knowledge to human readers that would interfere with the public privilege to disseminate disclosed knowledge, without ever mentioning inventors' disclosure obligations.[5] Similarly, the patent-ineligibility of mental processes forbids many claims that might interfere with the public privilege to employ the disclosed knowledge to generate further innovation in the form of design-arounds or improvements, again without ever expressly mentioning this goal.[6] In these situations, recognizing the structural implications of inventors' disclosure obligations leads to a sorely needed bout of conceptual housekeeping, providing doctrinal coherence that is today absent and thus long-term stability for extant doctrines that today rest on shaky foundations. It also reveals a single analytical and policy thread that weaves its way through what is today perceived as a set of disparate, unrelated aspects of patent law.

However, in other situations that are closer to the periphery of the public privilege to use disclosed knowledge itself, recognizing the structural implications of inventors' disclosure obligations may influence debates over what restrictions patent law ought to impose on patentees' rights. With respect to the dissemination of disclosed

4. *Cf.* Kevin Emerson Collins, *The Knowledge/Embodiment Dichotomy*, 47 U.C. DAVIS L. REV. 1279, 1285–87 (2014) (arguing that contemporary patent law implements a knowledge/embodiment dichotomy in a de facto sense but not a *de dicto* sense).

5. *See infra* notes 63–67, 73–81, and accompanying text.

6. *See infra* notes 124–128 and accompanying text.

knowledge, should the making and selling of texts that are also components of machines (including software and DNA molecules)[7] or instructional texts that are packaged with conventional technologies[8] be infringing activities? How about the dissemination of texts when the disseminator intends to induce others to use the knowledge to make, use, or sell patentable technological applications of the disclosed knowledge?[9] The democratization of three-dimensional printing is a hotly debated, contemporary issue that raises more than one of these questions: When should the dissemination of data files of the three-dimensional shape of an inventive product be actionable, infringing conduct?[10] With respect to a reader's right to understand and think about disclosed knowledge, should human cognition employing disclosed knowledge ever be an advance over the prior art that gives rise to a patentable invention, or would the resulting claims impinge on the public privilege to use disclosed knowledge itself?[11] These questions touch on the proper reach of the structural implications of inventors' disclosure obligations and demonstrate that the scope of the public privilege to use disclosed knowledge itself is a legitimately contestable issue. There are difficult policy debates to flush out and hard line-drawing issues to be resolved.[12] When working at the periphery of the public privilege to use disclosed knowledge itself, this Article frames the debates that the patent community should be having and identifies costs and benefits of different conceptions of the activities that make up the privilege.

This Article proceeds in three parts. Part I reviews the multifaceted nature of disclosure theory in order to identify with greater precision the pre-expiration, public-knowledge strain of disclosure theory at issue in this Article. Part II introduces the structural implications of inventors' disclosure obligations under this strain of disclosure theory and identifies a statutory basis for limiting patentees' rights so as to generate an as-of-right public privilege to use disclosed knowledge itself before patent expiration. Part III addresses different conceptions of the substance of this privilege and what limits on patent rights might therefore be required to safeguard it.

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7. *See infra* Section III.A.1.

8. *See infra* Section III.A.2.

9. *See infra* Section III.A.3.

10. *See infra* notes 96–102, 118–119, and accompanying text.

11. *See infra* Section III.B.

12. In some instances, the state of contemporary patent law is also unclear, making it difficult to know whether recognizing an activity as part of the public privilege to use disclosed knowledge itself would require a change in patent law.

I. DISCLOSURE THEORIES

The disclosure theory of patent law is often defined in part by distinguishing it from the incentive theory of patent law. Under incentive theory, the principal purpose of patent law is to provide innovation incentives.[13] Absent patent rights, rational individuals will not incur the sunk costs of innovation when those costs are significant because they will not expect to recoup those costs in a competitive market for the innovation that they produce. By granting innovators exclusive rights to their claimed inventions, patents create an expectation that successful innovators can internalize some fraction of the social welfare that their innovations generate and, hopefully, recoup their sunk costs. In contrast, disclosure theory focuses on the flows of public knowledge that patents create. Section 112(a) of the Patent Act requires that inventors disclose certain types of knowledge about their inventions as a condition of receiving exclusive rights.[14] Disclosure theory justifies patent law on the basis of the social benefit that this disclosed knowledge generates.

To speak more precisely about the social benefit of patent disclosures—and, eventually, about the structural implications of inventors' disclosure obligations—it is helpful to recognize that disclosure theory is not unitary. Although patent scholarship routinely uses the term "disclosure theory" in the singular, there is no single, agreed-upon mechanism through which patent disclosures generate social benefits. To the contrary, patent scholarship has identified several distinct disclosure theories, each highlighting a conceptually independent social benefit that flows from disclosure. The remainder of this Part offers an original categorization that distinguishes four strains of disclosure theory: a public-knowledge theory, a rights-limitation theory, a signal theory, and a broadcast theory of patent disclosures.

First, the public-knowledge theory of the disclosure grounds the social value of disclosures in the benefits of making technological knowledge freely available to the public, including inventors' competitors.[15] This benefit provided by publicly accessible knowledge

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13. U.S. CONST. art. I, § 8, cl. 8; STAFF OF SUBCOMM. ON PATENTS, TRADEMARKS, AND COPYRIGHTS OF THE S. COMM. ON THE JUDICIARY, 85TH CONG., 2D SESS., AN ECON. REVIEW OF THE PATENT SYS. 21 (Comm. Print 1958) (prepared by Fritz Machlup) [hereinafter Machlup].

14. 35 U.S.C. § 112(a) (2012).

15. The scholarship addressing the public-knowledge theory of patent disclosures is voluminous, and much of it focuses on the theory's weaknesses. *See, e.g.*, Alan Devlin, *The Misunderstood Function of Disclosure in Patent Law*, 23 HARV. J.L. & TECH. 401 (2010); Rebecca S. Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, 56 U.

is different after and before patent expiration. After expiration, disclosures allow the public to practice the claimed invention. But for the presence of an enabling disclosure in the specification, inventors could continue to enjoy de facto exclusivity after patent expiration if they protect knowledge of how to make or use the claimed technology as a trade secret.[16] Before expiration, disclosures stimulate others to engage in the inventive activity even though they do not practice the claimed invention. Competitors can access the disclosed knowledge, comprehend it, and disseminate it; they can use it as an input into the cognitive processes that lead to further innovation in the form of design-arounds and improvements.[17]

The public-knowledge theory of disclosure is implicit in the Supreme Court's repeated description of patent law as a quid pro quo or bargain in which inventors and the public exchange valuable rights. The public, via the state, grants inventors rights to exclude competitors from the claimed technology, and, in return, inventors disclose knowledge to the public that they otherwise could have attempted to protect as a trade secret.[18] The quid pro quo narrative

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CHI. L. REV. 1017 (1989); Jeanne C. Fromer, *Patent Disclosure*, 94 IOWA L. REV. 539 (2009); Lisa Larrimore Ouellette, *Do Patents Disclose Useful Information?*, 25 HARV. J.L. & TECH. 545 (2012); Jason Rantanen, *Patent Law's Disclosure Requirement*, 45 LOY. U. CHI. L.J. 369 (2013); Jason Rantanen, *Peripheral Disclosure*, 74 U. PITT. L. REV. 1 (2012); Sean B. Seymore, *The Teaching Function of Patents*, 85 NOTRE DAME L. REV. 621, 627 (2010); Katherine J. Strandburg, *What Does the Public Get?: Experimental Use and the Patent Bargain*, 2004 WIS. L. REV. 81, 101; Note, *The Disclosure Function of the Patent System (or Lack Thereof)*, 118 HARV. L. REV. 2007, 2028 (2005); *cf.* Dan L. Burk, *The Role of Patent Law in Knowledge Codification*, 23 BERKELEY TECH. L.J. 1009, 1012 (2008) (suggesting that "many familiar provisions of the patent statute may be viewed as incentives for codification of otherwise tacit knowledge").

16. The post-expiration strain of public-knowledge disclosure theory has a long pedigree in the Supreme Court. *See, e.g.*, Universal Oil Prods. Co. v. Globe Oil & Ref. Co., 322 U.S. 471, 484 (1944); United States v. Dubilier Condenser Corp., 289 U.S. 178, 186–87 (1933); Grant v. Raymond, 31 U.S. (6 Pet.) 218, 247 (1832). In fact, it reaches back to England in the eighteenth century. Edward C. Waltersheid, *The Early Evolution of the United States Patent Law: Antecedents (Part 3)*, 77 J. PAT. & TRADEMARK OFF. SOC'Y 771, 796–97 (1995) (discussing *Liardet v. Johnson*, 1 Carp. P.C. 35 (K.B. 1778)).

17. The pre-expiration strain of public-knowledge disclosure theory was first overtly discussed in patent scholarship in the middle of the twentieth century. Machlup, *supra* note 13, at 25 n.135; John C. Stedman, *Invention and Public Policy*, 12 LAW & CONTEMP. PROBS. 649, 666 (1947). Hints of the value of public knowledge prior to patent expiration reach back much further. WILLIAM C. ROBINSON, 1 THE LAW OF PATENTS FOR USEFUL INVENTIONS 52 (Boston, Little, Brown & Co. 1890) (noting that a patent "secures to the public an immediate knowledge of the character and scope of the invention"). For more recent discussions, see *infra* notes 41–48 and accompanying text.

18. *See* Pfaff v. Wells Elecs., Inc., 525 U.S. 55, 63 (1998); Bonito Boats, Inc. v. Thunder Craft Boats, Inc., 489 U.S. 141, 150–51 (1989); Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 484 (1974). The quid pro quo is often criticized as not giving the public sufficient benefit because many patented inventions could not be both commercialized and kept secret in the absence of a patent. Eisenberg, *supra* note 15, at 1028–30.

highlights that disclosures are not in the self-interest of inventors. They are a "price" that is "exacted from" patentees in return for protection.[19] They are positive externalities enjoyed by firms' competitors that, all else being equal, the firms would like to forego.[20] In short, disclosures are beneficial to society, but costly to inventors.

Second, rights-limitation theory locates the public benefit of the disclosure in the disclosure's instrumental role in shaping patent claims.[21] Here, the end goal of the disclosure is not to provide competitors with useful knowledge. Rather, disclosures are a means to the end of appropriately sized claims. Patent examiners and judges use disclosures to pare down permissible claim scope, limiting it so that it remains proportional to the contribution to progress that an inventor actually makes.[22] The enablement and written description doctrines of § 112(a),[23] along with the rules of means-plus-function claiming of § 112(f),[24] are the primary doctrinal mechanisms through which the disclosure limits claim scope.[25] The thread that runs through all of these doctrines is that the disclosure is an instrument that examiners and judges use to restrict the rights to which patent owners are entitled.[26] Under rights-limitation theory, inventors have

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19. Eldred v. Ashcroft, 537 U.S. 186, 216 (2003); *see also* THOMAS G. FESSENDEN, AN ESSAY ON THE LAW OF PATENTS FOR NEW INVENTIONS 48–49 (1st ed. 1810) ("The specification is the price which the patentee is to pay for his monopoly.").

20. Kenneth W. Dam, *The Economic Underpinnings of Patent Law*, 23 J. LEGAL STUD. 247, 267 (1994); Suzanne Scotchmer & Jerry Green, *Novelty and Disclosure in Patent Law*, 21 RAND J. ECON. 131, 132 (1990).

21. Insofar as disclosure theories are defined in juxtaposition to incentive theories that are concerned with increasing suboptimal investment in invention and innovation, the rights-limitation theory is not a disclosure theory at all. It is rather a subtheory of innovation theory addressing how to properly tailor patent incentives.

22. Scholarship addressing the rights-limitation theory of disclosure is also voluminous. *See, e.g.*, Christopher A. Cotropia, *What Is the "Invention"?*, 53 WM. & MARY L. REV. 1855 (2012); Oskar Liivak, *Rescuing the Invention from the Cult of the Claim*, 42 SETON HALL L. REV. 1 (2012).

23. 35 U.S.C. § 112(a) (2012). Under enablement, the set of claimed technologies must remain tethered to the set of technologies that the disclosure teaches a person of ordinary skill in the art to make and use without undue experimentation. *In re* Fisher, 427 F.2d 833, 839 (C.C.P.A. 1970). Under written description, the claimed set must be commensurate with the set of technologies for which the disclosure reveals important structural properties. Ariad Pharm., Inc. v. Eli Lilly & Co., 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc).

24. In some ways, reiterating the rule of written description as part of the doctrine of claim construction, means-plus-function claiming ensures that the scope of claims using functional language is restricted to the disclosed structures and their equivalents. *See* 35 U.S.C. § 112(f) (2012).

25. The use of the disclosure to shape claim scope through the process of claim construction remains controversial. Retractable Techs., Inc. v. Becton, Dickinson & Co., 653 F.3d 1296 (Fed. Cir. 2011), *reh'g en banc denied*, 659 F.3d 1369 (Fed. Cir. 2011).

26. The disclosure plays another supporting role for patent claims as well: it helps to clarify what claim terms mean. Universal Oil Prods. Co. v. Globe Oil & Ref. Co., 322 U.S. 471,

incentives to provide more robust disclosures in order to obtain broader claims. However, disclosures remain a price that inventors must pay in the sense that inventors still have incentives to minimize the disclosure to the smallest possible quantum of knowledge that will uphold the claims that they seek.

Third, the signal theory of disclosure posits that patent disclosures generate a social benefit because they serve as a mechanism for patent applicants to communicate information that they want to communicate but that they cannot otherwise effectively communicate. The Patent and Trademark Office ("PTO") has examined the disclosures in issued patents and deemed them sufficient to support valid patent claims.[27] When the disclosed knowledge has been stamped with this government seal of approval, patent disclosures serve a signaling function. They provide a low-cost means of sending credible signals to capital markets about the quality of the research and development capabilities of the patenting firm.[28] Here, it is not the disclosed knowledge per se that provides a social benefit. Rather, it is the government imprimatur that accompanies an issued patent based on that knowledge that provides the benefit. Unlike the public-knowledge and rights-limitation theories, signal theory rejects the notion that disclosure is a price that is exacted from patent applicants. Disclosure is instead an act that furthers patent applicants' self-interest and, indirectly, benefits society.

Fourth, the broadcast theory of disclosure focuses on the consensual, contractual exchanges of knowledge for valuable consideration that are facilitated by patentees' exclusive rights. Knowing that they have exclusive rights to the most straightforward, commercial uses of their inventions, inventors can communicate or broadcast knowledge about their research and development efforts to potential rights purchasers without being concerned about appropriation and use of the knowledge without payment.[29] In the

484 (1944) (describing disclosures as "essential to warn the industry concerned of the precise scope of the monopoly asserted").

27. Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625, 636 (2002).

28. Clarisa Long discusses two types of signals: patent counts, *id.* at 646, and the information disclosed in patent specifications, *id.* at 647. Only the latter suggests that the patent disclosure in particular serves a signaling function.

29. The pre-expiration variant of the public-knowledge theory of the disclosure focuses on the social benefit of the noncontracting members of the public being able to engage in uses of the disclosed knowledge that are not covered by patent claims. *See supra* note 17 and accompanying text. In contrast, the broadcast theory of the disclosure focuses on the social benefit created when members of the public can assess the private value of engaging in uses of the disclosed knowledge that are covered by patent claims. This assessment is necessary for the public to determine whether it wants to license or purchase a patent. *See infra* notes 30–31 and accompanying text.

context of bilateral negotiations, patents resolve Arrow's information paradox.[30] Patent disclosures allow information possessors to communicate that information to potential buyers without concern that a potential buyer, who must know the information before payment in order to determine whether he wants to buy it, will take the information without payment. Scaling up the same idea to one-to-many communication, patent disclosures serve as a beacon of sorts, allowing the parties who believe that they can put the patented knowledge to productive commercial use to approach the patent owner for a license.[31]

II. THE STRUCTURAL IMPLICATIONS OF PRE-EXPIRATION PUBLIC KNOWLEDGE

The structural implications of inventors' disclosure obligations follow from one specific strain of disclosure theory—namely, the pre-expiration variant of the public-knowledge theory. The fact that patents make disclosed knowledge immediately available for certain public uses before expiration—including inter alia comprehension, dissemination, design-around, and improvement—necessitates that patent owners not be able to draft claims that subject those uses to private control.[32] That is, if the public privilege to use disclosed knowledge in these ways is to be as-of-right, not permissive in the sense that an inventor can opt out of it by strategically drafting claims that turn the use of disclosed knowledge into an infringing activity,

30. Robert P. Merges, *A Transactional View of Property Rights*, 20 BERKELEY TECH. L.J. 1477, 1489–90 (2005).

31. F. Scott Kieff, *On Coordinating Transactions in Intellectual Property: A Response to Smith's Delineating Entitlements in Information*, 117 YALE L.J. POCKET PART 101 (2007), http://yalelawjournal.org/forum/on-coordinating-transactions-in-intellectual-property-a-response-to-smiths-delineating-entitlements-in-information [https://perma.cc/98QH-J8AS]; Roberto Mazzoleni & Richard R. Nelson, *Economic Theories About the Benefits and Costs of Patents*, 32 J. ECON. ISSUES 1031, 1039 (1998). Although it is not conventionally classified as a disclosure theory, the prospect theory of patent law articulated by Edmund Kitch identifies another social benefit that follows from patent law's one-to-many disclosure. Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265 (1977). Disclosures reduce the wasteful, duplicative efforts that occur when firms guard trade secrets. *Id.* at 279. If one firm's disclosure teaches other firms an efficient process for making a wheel, the other firms' research and development will no longer be focused on independently rediscovering that particular way of making a wheel. *Id.* at 279–80.

32. The conventional rights-restriction theory of the disclosure limits patent rights so that they are proportional to inventors' contribution to technological progress. *See supra* notes 21–26 and accompanying text. In contrast, the restriction on patentees' rights that is needed to protect the public's pre-expiration access to disclosed knowledge does not demand proportionality between inventors' contributions and their claims. To the contrary, it prohibits patentees from obtaining certain types of exclusive rights; namely, those that interfere with the public privilege to use disclosed knowledge prior to patent expiration.

there must be limits on the rights that patent law can grant to inventors. Under simple Hohfeldian logic, the patent owner cannot have a right to exclude the public from engaging in certain uses of disclosed knowledge if the public has a privilege to engage in those very uses.[33]

A bit of new terminology is helpful here. For convenience, this Article refers to the uses of disclosed knowledge that inventors' disclosure obligations vest in the public as *uses of disclosed knowledge itself*. Inversely, this Article refers to the remaining uses of disclosed knowledge that, if claimed and privatized, would not allow inventors to opt out of their disclosure obligations as *uses of disclosed knowledge in technological applications*.[34] To illustrate with simple examples, disseminating a text representing the fact that a new drug has a particular molecular structure is a use of disclosed knowledge itself, whereas manufacturing a pill containing molecules of the new drug is a use of disclosed knowledge in a technological application. This newly coined terminology is necessary because, to date, there has not been any express discussion of the structural implications of inventors' disclosure obligations, so there is no existing terminology for referring to the affirmative public privilege to use disclosed knowledge that the disclosure obligations entail.[35]

Laying out the case that inventors' disclosure obligations mandate doctrinal limits on the types of uses of disclosed knowledge that inventors can control requires a defense of two interdependent propositions. First, § 112(a) of the Patent Act establishes an as-of-right public privilege to use disclosed knowledge itself during a patent's term. Second, other sections of the Patent Act must impose limits on the rights to which patentees are entitled in order to preserve this privilege and prevent inventors from privatizing it through strategic claiming. The remainder of this Part examines each

33. Wesley Newcomb Hohfeld, *Some Fundamental Legal Conceptions as Applied in Judicial Reasoning*, 23 YALE L.J. 16, 30 (1913) (arguing that every legal advantage attained by one person forcibly implicates a correlative disadvantage suffered by another person).

34. This terminology is imperfect. For other attempts by the author to coin language for drawing similar distinctions, see Collins, *supra* note 4, at 1281, 1295 (positing a knowledge/embodiment dichotomy); Kevin Emerson Collins, *Claims to Information* Qua *Information and a Structural Theory of Section 101*, 4 I/S: J.L. & POL. FOR INFO. SOC'Y 11, 11 (2008) (distinguishing patentable and unpatentable embodiments of information).

35. Most commentary addressing the pre-expiration strain of public-knowledge disclosure theory only refers to the public's privileged uses in the negative, noting that the public is free to use disclosed knowledge in any way that does not produce a technology that falls within the scope of a claim. *See, e.g.*, *infra* notes 41–48, 53–55, and accompanying text. This way of talking about the issue is inadequate. It makes the thesis of this Article—namely, that some uses of disclosed knowledge cannot be privatized, regardless of the claims that inventors seek—impossible to articulate.

proposition in turn. To calibrate expectations, it is perhaps important to reiterate that the reason for making this case is not that contemporary patent law grants vastly overbroad rights or that radical changes to the scope of what can be patented are needed to fully protect the public privilege to use disclosed knowledge itself. As explored below in Part III, contemporary patent law already provides de facto protection for the core of the public pre-expiration privilege to use disclosed knowledge itself, and the contested issues lie only at selected spots on the periphery of the privilege.[36] Thus, in most, but not all, situations, the most important reasons for exploring the structural implications of inventors' disclosure obligations are increased conceptual coherency and legitimacy in patent doctrine.

As to the first proposition, an as-of-right public privilege to use disclosed knowledge itself during a patent's term is not expressly codified in the Patent Act. Rather, it must be inferred from the Act's deep structure.[37] The explicit text of § 112(a) does not limit what inventors can claim or the exclusive rights to which they are entitled; it does not expressly provide for a public privilege to use disclosed knowledge itself before patent expiration. Section 112(a) only specifies the type of knowledge that must be disclosed in the specification.[38] It says nothing in overt terms about ensuring that the public can use that knowledge in any way prior to patent expiration, although the timing of the publication of the disclosure upon issuance, or usually beforehand, does permit an inference that the public is intended to benefit from the disclosure in some way prior to expiration.[39] Yet, the prominent billing given to the public-knowledge theory of the

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36. The task of determining what changes to contemporary patent law are needed to fully protect this privilege is complicated by controversies about both the set of activities that should constitute the public privilege to the use of disclosed knowledge itself at its periphery and the state of contemporary patent law. *See generally infra* Part III.

37. *See infra* notes 56–67 and accompanying text (grounding the public privilege to use disclosed knowledge itself in a structural interpretation of the Patent Act).

38. The statute states:

> 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 or joint inventor of carrying out the invention.

35 U.S.C. § 112(a) (2012).

39. Eisenberg, *supra* note 15, at 1022 ("If the public had absolutely no right to use the disclosure without the patent holder's consent until after the patent expired, it would make little sense to require that the disclosure be made freely available to the public at the outset of the patent term."). Eisenberg makes this argument in the context of arguing that some experimental uses of claimed technologies should not amount to infringement. *Id.* This Article does not reach the experimental use issue but instead argues that the public should be able to use the disclosed knowledge itself prior to patent expiration.

disclosure, and its pre-expiration branch in particular, strongly suggests that a privilege has by now been read into § 112(a). As the following paragraphs demonstrate, the assumption that the public has an affirmative privilege to use disclosed knowledge itself during the patent term permeates patent opinions and scholarship on disclosure.[40] Interestingly, however, the privilege has never been given an in-depth treatment. The explanation for this repeated superficial treatment is likely that the privilege is so fundamental in the patent community that it is not treated as a legal assertion in need of an extensive defense or prolonged justification.

Courts usually state the privilege to use disclosed knowledge itself during the patent term in passing as a premise in arguments that are focused elsewhere. For example, as the Supreme Court stated in *Kewanee Oil Co. v. Bicron Corp.* in the lead up to its holding that federal patent law does not preempt state trade secrecy laws, "When a patent is granted and the information contained in it is circulated to the general public and those especially skilled in the trade, such additions to the general store of knowledge . . . stimulate ideas and the eventual development of further significant advances in the art."[41] Similarly, in the course of discussing the patent-ineligible subject matter, the Federal Circuit, almost as an aside, noted that "[e]ven after a patent has been awarded for a new, useful, and nonobvious practical application of an idea, others may learn from the underlying ideas, theories, and principles [conveyed in the disclosure] to legitimately 'design around' the patentee's useful application."[42] These are typical of the judicial statements that posit the existence of a public privilege to engage in certain uses of disclosed knowledge, such as uses that "stimulate ideas" in the public's minds and uses that allow the public to "learn from" the knowledge, without exploring the privilege in detail.

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40. *See infra* notes 41–48 and accompanying text.

41. 416 U.S. 470, 481 (1974). At the time, patent disclosures were not published until issuance. Today, information is often circulated to the general public at an earlier publication date. 35 U.S.C. § 122(b).

42. *In re* Alappat, 33 F.3d 1526, 1553 (Fed. Cir. 1994) (Archer, C.J., dissenting); *see also In re* Argoudelis, 434 F.2d 1390, 1394 (C.C.P.A. 1970) (Baldwin, J., concurring) (noting that disclosures add "a measure of worthwhile knowledge to the public storehouse" when they become accessible to the public). When linking the right to design-around to the use of disclosed knowledge itself, it is important to differentiate two possible points of infringement. First, to successfully design-around a patent claim, the end product or method must not fall within the original claim. Second, to avoid infringement, the access to, dissemination of, and cognition employing the disclosed knowledge that occurs during the design-around process, likely before the end product or method has been developed, must not violate the original patent owner's rights. Only the second possible point of infringement is relevant to the public privilege to use the disclosed knowledge itself as defined in this Article.

Patent scholars have taken a similar approach: the public privilege to use disclosed knowledge itself is taken as axiomatic, not a topic that merits prolonged consideration. In his patent treatise, Peter Rosenberg notes that "anyone is free to think and to write about what is covered by the patent without trespassing upon the exclusive right of the patentee."[43] In the course of laying the groundwork for the experimental use doctrine, Rebecca Eisenberg notes that the "disclosure becomes freely available to the public as soon as the patent issues; the patent holder may not thereafter monitor or control access to it."[44] In a similar context, Kathy Strandburg opines that "the disclosure requirements are intended to benefit the public interest in faster-paced follow-on innovation by privileging the 'use' of a patented inventive idea in developing improved or alternative follow-on inventions during the patent term. No license or authorization is required for this activity."[45] In explaining the public benefit of disclosures, Jeanne Fromer asserts, without any discussion of the mechanism involved, that disclosures "stimulate[ ] future innovation by revealing the invention's design so that others can . . . design around, improve upon, or be inspired by the invention, even during the patent term."[46] These respected commentators, as well as many others,[47] take the existence of a public privilege to use disclosed knowledge itself during the patent term for granted.

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43. PETER D. ROSENBERG, PATENT LAW FUNDAMENTALS 10 (1975).

44. Eisenberg, *supra* note 15, at 1022.

45. Strandburg, *supra* note 15, at 101. Note the scare quotes around the word "use": the use of disclosed knowledge itself is taken to be something different from the normal meaning of the term "use" in the sense of the use of a patented idea in a technological application that can infringe a patent. *See* 35 U.S.C. § 271(a) (2012) (including the right to "use" claimed technology among patentees' exclusive rights).

46. Fromer, *supra* note 15, at 541; *see also* Strandburg, *supra* note 15, at 106.

47. *See, e.g.*, Daniel R. Cahoy, *Treating the Legal Side Effects of Cipro®: A Reevaluation of Compensation Rules for Government Takings of Patent Rights*, 40 AM. BUS. L.J. 125, 131–32 (2002) (arguing that "the inventor's disclosure . . . promotes the progress of the 'useful arts' by . . . conveying knowledge of state-of-the-art innovations to the public while they are still current, creating an incentive for clever individuals to design around the invention"); Timothy R. Holbrook, *Possession in Patent Law*, 59 SMU L. REV. 123, 133 (2006) ("[T]he disclosure in the patent is . . . designed . . . to enrich the state of the art contemporaneously with the invention."); Richard C. Levin et al., *Appropriating the Returns from Industrial Research and Development*, *in* 3 BROOKINGS PAPERS ON ECON. ACTIVITY 783, 805 (1987) ("The choice between obtaining a patent and maintaining secrecy may be influenced by the extent to which the disclosures made in the patent document facilitate inventing around the patent."); Craig Allen Nard, *A Theory of Claim Interpretation*, 14 HARV. J.L. & TECH. 1, 4 n.10 (2000):

> It would be difficult to overstate the importance of patent law's disclosure requirements . . . . A principal function of the disclosure requirements is to provide other artisans in the technical field with information that enlarges the storehouse of knowledge, and therefore spur these artisans to improve upon or design around the claimed invention—thus leading to further technological progress;

Rebecca Eisenberg and Arti Rai provide one of the most in-depth discussions of the public privilege to use knowledge itself during a patent's term that is worth quoting at length:

> Information is so valuable that society will not permit it to be monopolized. This is the sense that emerges from reading cases about disclosure in the patent system, in which courts treat the informational content of patent applications as the public's quid pro quo that justifies the issuance of patents. In this story, disclosure of unprotected information is not an incidental byproduct of a process that aims to motivate something more worthwhile, but is the whole purpose of the system. We promote disclosure of precious information by rewarding disclosure with exclusionary rights in something else.
>
> By requiring public disclosure of information about an invention while limiting the exclusive rights to the inventions defined in claims, patent law not only fails to protect information but actually pushes it into the public domain as a spillover. Yet, while the information disclosed in a patent application is publicly available, the exclusionary rights from the patent might still protect the patent owner from its unauthorized use if the use involves infringing the patent claims. If an inventor discloses in a patent application how to make and use a new mousetrap and a patent issues with claims drawn to the mousetrap, anyone who follows the directions in the disclosure to make and use the claimed mousetrap would be liable for infringement. A reader, on the other hand, who uses the disclosed information to problem-solve and devise a new spring-loaded device falling outside the scope of the mousetrap patent claims would not be liable, though the patent disclosure may have been invaluable to the reader in solving his problem. While patent claims legally constrain the use of information disclosed in patent specifications, the public disclosure of the information may also facilitate other non-infringing uses of that information.[48]

Two points in this passage are worth highlighting. First, Eisenberg and Rai emphasize that a public privilege to use disclosed knowledge itself during a patent's term is an important design feature of the Patent Act: patent law doesn't passively "fail to protect" knowledge but rather actively "pushes it into the public domain as a spillover" due to the high social value of public knowledge. Second, they suggest that, in order to understand how patent protection works, we need to be able to draw a line between uses of disclosed knowledge itself (the "disclosure" that is given to the public) and uses of disclosed knowledge in technological embodiments (the "something else" in which exclusive rights are granted).

Assuming the existence of a public privilege to use disclosed knowledge itself has been established, the second proposition is that doctrinal restrictions on patentees' rights are needed to protect this privilege by preventing a patent owner from using strategically drafted claims to privatize the very activities that public-knowledge

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David J. Teece & Edward F. Sherry, *Standards Setting and Antitrust*, 87 MINN. L. REV. 1913, 1964 (2003) ("[I]f [an] application is immediately made public, others can see the disclosure and rush in to file patent applications that 'flank' the initial application.").

48. Rebecca S. Eisenberg & Arti K. Rai, *Harnessing and Sharing the Benefits of State-Sponsored Research: Intellectual Property Rights and Data Sharing in California's Stem Cell Initiative*, 21 BERKELEY TECH. L.J. 1187, 1194–95 (2006) (citations omitted).

disclosure theory assumes he must publicize. Sometimes, legal rules are not necessary to prevent behavior from occurring because the behavior cannot be accomplished given the current state of technology.[49] If no skilled patent drafter could ever draft a claim that would turn the use of disclosed knowledge itself into infringement, then no doctrinal restrictions on patent rights would be needed to enforce inventors' disclosure obligations. Polk Wagner alluded to this possibility when he argued that patent disclosures inevitably create spillovers because "[i]t turns out that information," or knowledge as discussed here, "*does* 'want to be free.' "[50] However, the belief that the use of knowledge itself is inevitably beyond the reach of patent protection, regardless of the rules defining the contours of inventors' rights, is misguided: human mental states and extramental signs both embody human knowledge, and both can readily be described by patent claims.[51] Thus, doctrinal limits on patentees' rights are needed to guarantee the public privilege to use disclose knowledge itself prior to patent expiration.

For proof of concept, consider two simple hypotheticals. Imagine that an inventor has developed a new method of using XYZ, a pharmaceutical drug, based on the fact that the adverse side effects of XYZ are significantly reduced if XYZ is regularly consumed with grapefruit juice. A patent drafter could claim "printed matter conveying the fact that XYZ's side effects are significantly reduced when consumed with grapefruit juice." Alternatively, the drafter could describe the method of "reading a statement of the fact that XYZ's side effects are significantly reduced when consumed with grapefruit juice," "communicating the fact that XYZ's side effects are significantly reduced when consumed with grapefruit juice," or simply "understanding that XYZ's side effects are significantly reduced when consumed with grapefruit juice." These hypothetical claims demonstrate that, absent provisions in patent law that restrict what

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49. For example, even assuming a public right to live on a planet free from teleportation, no legal prohibition on teleportation is today needed to protect that right because teleportation is impossible, at least given current technology.

50. R. Polk Wagner, *Information Wants to Be Free: Intellectual Property and the Mythologies of Control*, 103 COLUM. L. REV. 995, 999 (2003). In reaching this conclusion, Wagner appears to only consider claims drafted at high levels of generality, not claims that encompass uses of disclosed knowledge itself. *Id.* at 995–99

51. We often talk about the use of disclosed knowledge itself as "disembodied" as shorthand to differentiate it from the uses of disclosed knowledge that routinely give rise to infringement. *See, e.g.*, Zvi Griliches, *The Search for R&D Spillovers*, 94 SCANDINAVIAN J. ECON. 29, 39 (1992). If knowledge had no material basis, then it might be difficult to refer to with the descriptive language of a patent claim. However, technological knowledge does not float somewhere in a noetic ether. It exists in the material world in the form of both meaningful mental states and extramental signs that are meaningful to human minds. Collins, *supra* note 4, at 1283–84.

can be patented, patent owners could strategically draft claims privatizing the very uses of disclosed knowledge itself that they are supposed to publicize. Concededly, they likely seem farfetched with respect to the claims that applicants regularly seek in practice. But this observation is beside the point given the argument at hand. These claims deviate from the norm we know today only because there are well-established restrictions on patentability that would lead to their rejection at the PTO.[52] We need patent doctrine that limits patentees' rights in order to protect the public's ability to use disclosed knowledge itself during the term of a patent. Without it, inventors could use strategically drafted claims to opt out of their obligation to make uses of disclosed knowledge itself freely available to the public during the patent term.

It is principally the defense of the second premise—namely, the need for doctrinal limits on patentees' rights to protect the public privilege to use disclosed knowledge itself during the term of a patent—that differentiates the structural implications of inventors' disclosure obligations addressed in this Article from prior scholarship on patent disclosure. Prior scholarship assumes that the public's ability to use disclosed knowledge itself will necessarily lie beyond the reach of patentees' claims; it fails to consider that patentees' rights must be proactively limited in order to protect that ability and establish it as an as-of-right privilege.[53] The Eisenberg and Rai

52. The argument rebutted here is the aggressive argument that patent drafters could not draft claims that read on the public's use of disclosed knowledge itself even if they were freed from the restraints imposed by the statutory restrictions on patentability such as novelty, nonobviousness, utility, enablement, and patent eligibility. Part III addresses the more modest argument that patent drafters cannot draft valid claims that interfere with the public privilege to use disclosed knowledge itself given the current state of patent law and its limits on what can be patented. *See infra* Part III. This modest argument is complicated by controversies about both the set of activities that should constitute the public privilege to use disclosed knowledge itself at its periphery and the state of contemporary patent law.

53. The presumption that the public privilege to use disclosed knowledge itself is simply a privilege to engage in unclaimed uses of technology is commonplace. *See* ROSENBERG, *supra* note 43, at 10 (stating that the public privilege to use disclosed knowledge itself is limited by the principle that "none but the patentee or his licensees may lawfully embody what is covered by that patent, as by constructing the claimed device or by carrying out the steps of the claimed process"); Strandburg, *supra* note 15, at 101 (defining the public privilege as existing "as long as no one makes an embodiment of the follow-on invention that incorporates an infringing embodiment of the original invention"). One exception is a passage by Rebecca Eisenberg alluding to the structural implications of inventors' disclosure obligations. Rebecca S. Eisenberg, *Re-Examining the Role of Patents in Appropriating the Value of DNA Sequences*, 49 EMORY L.J. 783, 787 (2000) ("The exclusion of information itself from patent protection is also at least implicit in the statutory requirement that patent applicants make full disclosures of information about their inventions, with no restrictions upon public access to the disclosures once the patents issue.").

passage quoted above[54] is typical in this respect: the only legal principle shaping the public's ability to use disclosed knowledge itself during the patent term discussed in the passage is the practice of "limiting the exclusive rights to the inventions defined in claims."[55] The public's ability to use disclosed knowledge itself during the patent term is simply the ground to the figure of the exclusive rights granted to the patentee, and there is no mention of the limit on the exclusive-rights figure that is needed to protect and shape the public-privilege ground.

Before moving on in Part III to discuss the substantive reach of the public privilege to use disclosed knowledge itself and thus the restrictions on patentees' rights that are needed to safeguard the privilege, it is worth pausing and addressing the statutory basis for those restrictions.[56] There is no statutory provision that expressly articulates the restrictions.[57] Rather, the statutory basis for the restrictions follows from a structural interpretation of the statutes defining patentees' rights. Structural interpretation looks to the structure and purpose of a statutory regime as a whole when construing the language of any particular section of that regime.[58] The Patent Act has clear structure. It is built on a dual regime of publicizing disclosures and privatizing claims.[59] Section 112(a) implicitly codifies the disclosure side of the duality by establishing a public privilege to use disclosed knowledge itself before patent expiration.[60] A structural theory of statutory interpretation demands that the Patent Act's many sections other than § 112(a) that establish the rights of a patent owner be read in light of § 112(a) so as not to interfere with that privilege. In most circumstances, it is patent law's validity provisions defining the scope of a valid claim that will require structural interpretation.[61] In rarer circumstances, it is the

54. *See supra* text accompanying note 48.

55. Eisenberg & Rai, *supra* note 48, at 1194.

56. This Article leaves aside the issue of whether the Intellectual Property Clause of the Constitution or the First Amendment require a public privilege to use disclosed knowledge itself prior to patent expiration.

57. Section 112(a) does not even expressly articulate the public privilege to use disclosed knowledge itself, let alone the restrictions on patent rights that are needed to safeguard it. *See supra* notes 38–39 and accompanying text.

58. N.Y. State Conference of Blue Cross & Blue Shield Plans v. Travelers Ins. Co., 514 U.S. 645, 655 (1995); WILLIAM N. ESKRIDGE, JR., DYNAMIC STATUTORY INTERPRETATION 118–19 (Harvard Univ. Press 1994).

59. *See supra* note 3 and accompanying text.

60. *See supra* notes 41–48 and accompanying text.

61. *See* 35 U.S.C. §§ 101, 102, 103, 112 (2012) (codifying the principal validity provisions). Elsewhere, I have argued in favor of using a structural theory of statutory interpretation when construing the patent-eligibility provisions of § 101 in particular. Collins, *supra* note 4, at 1315–

infringement provisions defining patentees' rights with respect to their claimed inventions that will require structural interpretation.[62] Regardless of the particular type of statute at issue, however, courts can use structural statutory interpretation to find the breathing room in the Patent Act that Congress created to enforce inventors' obligations under the public-knowledge theory of the disclosure, even though that breathing room is not expressly articulated in any particular statutory provision.

One example of what the output of such structural interpretation of patent law's validity provisions might look like is the printed matter doctrine.[63] As explored in greater depth below, the contemporary printed matter doctrine, grossly stated, prohibits the patenting of texts representing the knowledge disclosed in a patent specification, and it plays an important role in limiting patent protection to avoid conflict with the public privilege to use disclosed knowledge itself before expiration.[64] Yet, the Patent Act does not expressly provide for the printed matter doctrine in any of its statutes. Rather, under the banner of the printed matter doctrine, courts have read restrictions on patent rights into several different validity provisions in several different statutes. They have read a restriction into § 101. Books conveying newly discovered knowledge to readers are "manufactures" in the plain-meaning sense of the term,[65] but courts have interpreted the statutory command in § 101 that a "manufacture" is patent eligible narrowly so that it excludes such books.[66] Courts have also read restrictions into the novelty doctrine of § 102 and the nonobviousness doctrine of § 103. Although there is nothing to this effect in the statutory text, courts have interpreted

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20; Kevin Emerson Collins, *Semiotics 101: Taking the Printed Matter Doctrine Seriously*, 85 IND. L.J. 1379, 1427–30 (2010); Collins, *supra* note 34, at 19–26. Although § 101 is a logical home for many of the limitations needed to protect the pre-expiration public privilege to use disclosed knowledge, I remain agnostic here on which provisions of the Patent Act should be interpreted in a structural manner to preserve that privilege.

62. *See* 35 U.S.C. § 271 (2012) (codifying infringement).

63. Courts do not recognize that the printed matter doctrine is the result of structural statutory interpretation. However, structural statutory interpretation provides an otherwise absent explanation for what the printed matter doctrine is and what it does.

64. *See infra* notes 73–81 and accompanying text.

65. The Oxford English Dictionary defines a manufacture as "an article, material, or commodity produced by physical labour, machinery, etc." *Manufacture*, OXFORD ENGLISH DICTIONARY, http://www.oed.com/view/Entry/113769?rskey=yfip2N&result=1&isAdvanced=false#eid (last visited Aug. 23, 2016) [https://perma.cc/U4HV-ZXFH].

66. *See In re* Sterling, 70 F.2d 910, 912 (C.C.P.A. 1934) (holding that the substance or language of that which is printed may not constitute patentable subject matter); *In re* Russell, 48 F.2d 668, 669 (C.C.P.A. 1931) ("The mere arrangement of printed matter . . . in book form . . . does not constitute 'any . . . manufacture' as provided in [the Patent Act].").

these sections to frequently ignore the content of printed matter when assessing the distinction of a claimed invention from the prior art.[67] The best explanation for this diverse set of interpretations of the statutes that restrict patentees' exclusive rights lies in a structural theory of statutory interpretation. To protect the public privilege to use disclosed knowledge itself before patent expiration, several different validity provisions in several different statutes must all be interpreted in light of § 112(a). Although it is not recognized as such today, the printed matter doctrine is a model for the structural statutory interpretation that is needed to enforce inventors' disclosure obligations.

III. WHAT ACTIVITIES ARE USES OF DISCLOSED KNOWLEDGE ITSELF?

The argument in the previous Part establishes in principle that the inventors' disclosure obligations have structural implications. If the public is to have an as-of-right privilege to use disclosed knowledge itself before patent expiration, patentees' statutory rights must be limited so that they do not interfere with that privileged use. The argument in this Part starts to fill in the content of the public privilege to use disclosed knowledge itself. Which uses of disclosed knowledge are unpatentable uses of disclosed knowledge itself and which are (possibly) patentable uses of disclosed knowledge in technological applications? In other words, what limits on patentees' exclusive rights are necessary to safeguard the public privilege?[68] The opinions and commentaries discussing the public benefits of freely available disclosed knowledge before patent expiration center on two activities. First, they address knowledge dissemination. Second, they address the imaginative human cognition that employs knowledge as

67. *See In re* Ngai, 367 F.3d 1336, 1338–39 (Fed. Cir. 2004) (rejecting a claim for a combination of a known product and novel written instructions for lack of novelty); *In re* Gulack, 703 F.2d 1381, 1385–87 (Fed. Cir. 1983) (employing the printed matter doctrine to determine that a claim was nonobvious in relation to the prior art). Michael Risch has proposed that the printed matter doctrine should be conceived as part of the § 101 utility doctrine. Michael Risch, *A Surprisingly Useful Requirement*, 19 GEO. MASON L. REV. 57, 80–81 (2011). In effect, Risch proposes a structural interpretation of the word "useful" in § 101 in light of the implicit requirement in § 112(a) for a public privilege to use disclosed knowledge itself prior to expiration. If one is willing to import a point of novelty or patentable-weight approach into the utility doctrine, this structural interpretation of the Patent Act is also a reasonable one. *Cf. infra* notes 104–105 (noting the printed matter doctrine employs the controversial point of novelty or patentable-weight approach).

68. This Article does not consider experimental uses of claimed, technological applications to be uses of disclosed knowledge itself, and it therefore does not address the implications of the pre-expiration strain of public-knowledge disclosure theory for the common law experimental use doctrine. *See* Eisenberg, *supra* note 15, at 1022; *supra* note 39.

an input and yields the conception of a design-around or improvement technology as an output.[69] There may be other ways to slice up the privilege, but the analysis below focuses on these two activities in order to flush out the privilege's contested details.

To avoid confusion, it is important to emphasize up front that the enablement and written description doctrines of § 112(a), which are the conventional focus of the rights-limitation theory of the disclosure,[70] do not provide the restrictions on patent protection needed to enforce inventors' disclosure obligations. Inventors' disclosure obligations mandate that inventors must be denied certain rights (i.e., rights that interfere with the public use of disclosed knowledge itself) regardless of how much and what type of knowledge the inventor discloses. Neither enablement nor written description does this work. The inventor can enable and demonstrate possession of any useful technology, provided he discloses enough knowledge about both how to make and use it and what it is as a structural matter. Viewed in a different way, greater disclosure leads to fewer restrictions on rights under enablement and written description. In contrast, under the structural implications of inventors' disclosure obligations, greater disclosure means a larger set of activities that constitute the public privilege to use the disclosed knowledge itself and a larger set of unobtainable rights.

A. Dissemination

The privilege to disseminate disclosed knowledge is part of the public privilege to use disclosed knowledge itself before patent expiration.[71] If claims to tangible representations of newly discovered knowledge were valid, anyone who duplicates or distributes the patent document, or who conveys the disclosed knowledge in another form, would be labeled as an infringer because he would make or use the claimed invention.[72] A patent regime that enforced such claims and

69. *See supra* notes 38–48 and accompanying text. Patent opinions and commentary also assume a public privilege to access disclosed knowledge. Access is today guaranteed by the free, electronic publication of issued patents and most patent applications. *Cf.* 37 C.F.R. § 1.71(e) (2013) (prohibiting the assertion of copyright rights in patent disclosures).

70. *See supra* notes 21–26 and accompanying text.

71. "[T]he patent statute does not identify the mere dissemination of data as a potentially infringing activity . . . ." Classen Immunotherapies, Inc. v. Elan Pharm., Inc., 786 F.3d 892, 898 (Fed. Cir. 2015). The Federal Circuit made this statement in the context of the statutory research exemption, but the reasoning employed suggests that it is not specific to that context.

72. 35 U.S.C. § 271(a) (2012) (defining direct infringement). If such claims were enforceable, patent protection would resemble copyright protection on steroids. Because of the idea/expression dichotomy, normal copyright finds infringement by duplication, dissemination, or

failed to protect a public privilege for the dissemination of disclosed knowledge would have an upside. It would allow inventors to internalize a larger fraction of the social welfare gain attributable to their research and development and thereby augment inventors' incentives to innovate yet further. In fact, it would plug an innovation-incentive hole: technological knowledge is often scientifically groundbreaking, costly to produce, and economically valuable, but the public privilege to disseminate disclosed knowledge means that innovators who generate knowledge without generating other new and useful things or processes get no patent protection, and thus have no patent-induced incentives.[73] But this cost of reduced innovation incentives attributable to the public privilege to disseminate knowledge is presumptively outweighed by the benefits of making the disclosed knowledge freely available to the public for distribution before patent expiration under the public-knowledge theory of the disclosure.

In our actual patent regime, the heavy lifting needed to protect the core of the public privilege to disseminate disclosed knowledge is already being done: the often maligned, and yet more often ignored, printed matter doctrine does the needed work.[74] The courts have interpreted the printed matter doctrine expansively to shield the dissemination of disclosed knowledge from privatization by patent claims, regardless of whether the knowledge is represented as printed text on paper,[75] electrons on a computer storage medium,[76] audio

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performance of a text only when the defendant's text is substantially similar to original expression in the plaintiff's text. Substantial similarity of ideas alone cannot support infringement. *See* Boisson v. Banian, Ltd., 273 F.3d 262, 268 (2d Cir. 2001) ("[C]opyright protection extends only to a particular expression of an idea, and not to the idea itself."). A patent regime that treats the dissemination of knowledge as infringement would hinge on the similarity of the factual knowledge represented in the defendant's text and the factual knowledge that an inventor discloses in the specification. It would protect what is labeled as a type of idea under copyright law.

73. Today, a combination of the printed matter doctrine and inherency produces this outcome. *See* King Pharm., Inc. v. Eon Labs, Inc., 616 F.3d 1267, 1274–80 (Fed. Cir. 2010) (employing both the printed matter doctrine and inherency to deny patent protection when an inventor discovers new knowledge about already-existing technology).

74. The doctrine is maligned for its lack of a statutory basis. *See infra* note 81 and accompanying text. It is ignored in the sense both that it is not discussed in patent casebooks and that courts frequently chose to resolve printed matter cases in unpublished opinions. Collins, *supra* note 4, at 1346–47.

75. *See In re* Ngai, 367 F.3d 1336, 1338–39 (Fed. Cir. 2004) (applying the printed matter doctrine to instructions included with a kit of chemicals).

76. Examination Guidelines for Computer-Related Inventions, 61 Fed. Reg. 7478, 7481–82 (Feb. 28, 1996) (discussing nonfunctional descriptive material in *Beauregard* claims).

recordings,[77] or sound waves in the air.[78] It is in large part thanks to the printed matter doctrine that openly recognizing inventors' disclosure obligations does not require a radical alteration of the reach of contemporary patent protection.[79] Instead, acknowledging inventors' disclosure obligations "merely" offers a logical explanation for why the printed matter doctrine should be doing the work that it already does. It "merely" creates conceptual clarity in an otherwise difficult-to-explain doctrine and provides an otherwise absent explanation for how the printed matter doctrine follows from the deep structure of the Patent Act.[80] This clarity and statutory grounding are important because the Federal Circuit has repeatedly cited the conceptual incoherence and nonstatutory nature of the printed matter doctrine to question the doctrine's future viability.[81] Here, work that is "merely" conceptual housekeeping can have immediate, real-world effects by ensuring that the printed matter doctrine gets the respect that it is due when it enforces the Patent Act's deep structure and protects public disclosures from privatization by claims.

In contrast, paying attention to the structural implications of inventors' disclosure obligations may suggest changes to the rights granted by the contemporary patent regime closer to the periphery of the public privilege to disseminate disclosed knowledge. The discussion below addresses three contestable issues concerning the proper reach of this privilege: the dissemination of texts that are also components of machines, the dissemination of instructional texts that are packaged with technological embodiments, and the dissemination of texts with an intent to induce infringement.[82]

Before addressing these controversial issues, however, it is perhaps helpful to pause and note two uncontroversial limits on the

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77. *Ex parte* Carver, 227 U.S.P.Q. (BNA) 465, 467 (B.P.A.I. 1985) (applying the printed matter doctrine to sound on a sound recording, although upholding the particular claim at issue).

78. *King Pharm., Inc.*, 616 F.3d at 1279 (applying the printed matter doctrine to spoken words).

79. This is a difficult proposition to support with a recent, litigated case. Litigated cases involving these core dissemination claims are few and far between today because, knowing that they will not obtain them, applicants do not draft them or appeal examiners' rejections of them.

80. *See supra* notes 58–67 and accompanying text.

81. *See In re* Gulack, 703 F.2d 1381, 1385 n.8 (Fed. Cir. 1983) ("A 'printed matter rejection' under § 103 stands on questionable legal and logical footing."); *see also In re* Lowry, 32 F.3d 1579, 1583 (Fed. Cir. 1994) (quoting *Gulack*, 703 F.2d at 1385 n.8).

82. Another contestable issue at the periphery of the public privilege to disseminate disclosed knowledge arises when earlier inventors develop novel measurement instruments, whether mechanical or electronic, and later inventors attach new labels to those instruments instructing the public how to understand the instruments' information outputs in a different manner. I have already addressed this issue at length elsewhere. *See* Collins, *supra* note 61, at 1431–42.

knowledge-disseminating acts that constitute the public privilege to disseminate disclosed knowledge. First, the privilege cannot encompass the distribution of goods that are uses of disclosed knowledge in technological applications, such as pharmaceutical pills or mousetraps, even though this distribution entails the dissemination of disclosed knowledge in the sense that users can examine the goods and glean the knowledge from them.[83] If it could, the exception would become the rule and patent protection in its entirety would be eliminated. The privilege must be limited to dissemination of the disclosed knowledge in the form of signs that represent facts and hypotheses about the world in a manner that is meaningful to a human reader.[84] The key here is representation. A representation uses a social convention (such as the convention underlying the English language) to convey knowledge to an interpreter who knows the social convention. Representations are useful only in the sense that they have meaning to a human interpreter, not in the sense that they achieve a nonsemiotic goal.[85] Second, the privilege to disseminate disclosed knowledge cannot prevent patent rights from ever hindering the dissemination of any knowledge representations. For example, an uncontroversial patent on a compression technology may block the effective distribution of representations of big data over a network.[86] The rights granted by patent claims conflict with the public privilege to disseminate knowledge only when the claims in a patent are targeted to the very knowledge that the patentee must disclose in the specification to demonstrate an advance over the prior art (i.e., when the claims recite the content of knowledge created by the inventor and disclosed in the specification as a limitation).[87]

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83. Some goods are self-disclosing, as in the case of a simple mousetrap. Others are not self-disclosing and must be reverse engineered to reveal the disclosed knowledge, as in the case of a pharmaceutical pill. The distribution of both types of goods disseminates disclosed knowledge.

84. A sign is something that stands for something else to an interpreter. Collins, *supra* note 61, at 1408–17. Limiting the public privilege to the dissemination of signs allows pharmaceutical pills and mousetraps to be patented. A pharmaceutical pill is not a sign that means the pharmaceutical pill because, in a sign, something must stand for something else, not for itself.

85. Collins, *supra* note 61, at 1413–17 (distinguishing causation from signification).

86. *But cf.* Intellectual Ventures I LLC v. Symantec Corp., 2016 WL 5539870, at *11–13 (Fed. Cir. Sept. 30, 2016) (Mayer, J., dissenting) (asserting that software claims to email filters and virus screens were invalid due to the First Amendment).

87. At first glance, it may seem odd to be more concerned about narrower claims that recite the content of knowledge as a limitation. The reason for this narrow focus is that only claims reciting such limitations can rely on representations of newly created knowledge to establish an advance over the prior art. *See infra* Section III.A.2.

1. Texts That Are Also Components of Machines

Core acts of knowledge dissemination involve representations, such as scientific articles or conference presentations, that are *only* intelligible to a human reader or auditor.[88] However, many codifications of knowledge are both texts that are legible to human minds through a social convention and components of, or instructions for, machines that are causally driven by deterministic processes. That is, they are what can be called *texts/components*.[89] Computer software is the most common example of a text/component.[90] A human computer programmer can read code as a set of representations: a human mind understands what the code means and can acquire knowledge from code about what functions the code performs when executed. But software on a storage medium is also like a really complex cog in a mechanical device. A computer can read software code, too, but in a different sense of the word "read": the computer deterministically follows the commands of the software code and actually executes its functions. The issue of texts that are also components of machines extends beyond software. In the biomedical arena, DNA molecules are the easiest examples of texts/components to spot.[91] Using a sequencing machine, a researcher can read the linear sequence of bases and, without actually producing a protein, glean knowledge about the protein that it produces. A cell can "read" DNA too, but only in the sense that it can follow the encoded instructions and actually produce the encoded protein.

Texts/components raise interesting issues for the public privilege to disseminate disclosed knowledge because, unlike texts, components of machines are conventionally patentable inventions.

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88. *See supra* notes 83–85 and accompanying text.

89. The difference between texts that are at the core of the dissemination privilege and texts/components that are not is one reason why this Article uses the term "knowledge" rather than "information." "Information" is ambiguous in that it can mean either instructions that are meaningful to a human interpreter or instructions that are meaningful to a deterministic machine. Collins, *supra* note 4, at 1312–14. In contrast, "knowledge" invokes the type of meaning that resides in human minds but not the type of meaning that exists when deterministic machines follow instructions. The very term "disclosure" suggests this mind-centered focus in disclosure theory: while it is common to say that a text/component discloses information to a human reader, it is awkward to talk about a text/component disclosing information to the machine in which it functions as a component.

90. *See* Dan L. Burk, *Patenting Speech*, 79 TEX. L. REV. 99, 101–05, 119–20 (2000) ("Software is not a text, it is a machine built of text.").

91. *See* Eisenberg, *supra* note 53, at 786–89 (noting the dual nature of DNA as both molecules and information); Symposium, *Molecules vs. Information: Should Patents Protect Both?*, 8 B.U. J. SCI. & TECH. L. 190, 196 (2002) (presentation of Professor Rebecca S. Eisenberg). For a view that all biotechnology is nothing but information, see Dan L. Burk, *The Problem of Process in Biotechnology*, 43 HOUS. L. REV. 561, 582–88 (2006).

Should the privilege to disseminate disclosed knowledge include a privilege to disseminate texts/components? As a descriptive matter, the answer today is the privilege does not extend this far. Patent doctrine permits claims to texts/components. Software-on-disk claims have been patentable ever since *In re Beauregard* in the 1990s, at least provided that method or programmed-computer claims to the same software invention are patentable.[92] Similarly, DNA molecules are patentable. The Supreme Court's recent opinion in *Myriad Genetics* held that isolated genomic DNA molecules with sequences of nucleotides corresponding to sequences that occur naturally are not patent eligible because they are products of nature, but it upheld the patentability of complementary DNA.[93] The patentability of complementary DNA demonstrates the public privilege to disseminate disclosed knowledge does not include a privilege to disseminate biological texts that are also components of cellular machinery.

There is no a priori answer as to whether the structural implications of inventors' disclosure obligations should prohibit the patentability of human-readable texts that are also machine components. On the one hand, valid claims to texts/components prevent the dissemination of the knowledge disclosed in a patent in a certain medium, and medium limitations usually do not save the patentability of claims that interfere with the dissemination of disclosed knowledge itself. A patentee cannot claim representations of disclosed knowledge limited to text printed in a particular language, a particular font, or on a particular type of paper any more than he can claim representations of disclosed knowledge generally. On the other hand, the gap in patent incentives that disallowing claims to texts/components would create might be considerable, and, in the software field, the formalism of allowing method and apparatus claims to software, but not claims to software programs on disks, would be difficult to swallow. In the end, to reach their current conclusion that texts/components are patentable, the courts likely, albeit implicitly, balanced the cost under disclosure theory (a minor impingement on the public privilege to disseminate disclosed knowledge prior to expiration) against the benefit under incentive theory (viable

92. 53 F.3d 1583, 1584 (Fed. Cir. 1995); *see also* Alice Corp. Pty. v. CLS Bank Int'l, 134 S. Ct. 2347, 2369 (2014) (holding that system, method, and media claims to software inventions rise and fall together if they claim the same substance). A text/component that is a part of a machine whose sole function is to display the knowledge represented by the text to a human user is equivalent to a simple text and is not patent-eligible subject matter. Examination Guidelines for Computer-Related Inventions, 61 Fed. Reg. 7478, 7481–82 (Feb. 28, 1996) (discussing nonfunctional descriptive material).

93. Ass'n for Molecular Pathology v. Myriad Genetics, Inc., 133 S. Ct. 2107 (2013).

incentives to innovate) to conclude that texts/components should be patentable. Yet, it is important to remain open to the idea that the courts might reach a different conclusion in other circumstances. For example, imagine an advance in computer compiler technology that automatically translates an English-language description of computer functionality into executable software code.[94] This advance would turn almost any dissemination of the disclosed knowledge in a software-patent specification into the dissemination of a text/component. Here, the balance might well come out the other way, as valid claims to texts/components under these circumstances would significantly hinder the free dissemination of disclosed knowledge.[95]

The technological and economic transformation being wrought by 3D printing and its democratization of manufacturing has put a practical, real-world example of the text/component issue at the center of contemporary patent debates.[96] In the traditional physical-product economy, manufacturing is centralized. The inventor of a mechanical device can enforce a patent against the limited number of manufacturers and distributors rather than the much larger, and more difficult to identify, group of the devices' end users, each with only a small amount of damages at issue. Once 3D printing becomes inexpensive and widespread, however, the economics of patent enforcement will change. Centralized electronic repositories may still create or simply aggregate 3D data files for mechanical devices,[97] but only the end user who prints (i.e., "makes") the device for his or her personal use will infringe traditional product claims. Absent some change in patent law, the only way of enforcing traditional product claims in a world in which 3D printing is commonplace will be the

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94. Collins, *supra* note 61, at 1422 n.233.

95. *See id.* (proposing a merger doctrine for texts/components in patent law).

96. For scholarship examining the implications of 3D printing for patent law, see Daniel Harris Brean, *Asserting Patents to Combat Infringement via 3D Printing: It's No "Use,"* 23 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 771 (2013) [hereinafter Brean, *It's No "Use"*]; Daniel Harris Brean, *Patenting Physibles: A Fresh Perspective for Claiming 3D-Printable Products*, 55 SANTA CLARA L. REV. 837 (2015) [hereinafter Brean, *Patenting Physibles*]; Ben Depoorter, *Intellectual Property Infringements & 3D Printing: Decentralized Piracy*, 65 HASTINGS L.J. 1483 (2014); Deven R. Desai & Gerard N. Magliocca, *Patents, Meet Napster: 3D Printing and the Digitization of Things*, 102 GEO. L.J. 1691, 1703–05 (2014); Sam Dillon, *Infringement by Blueprint: Protecting Patent Rights in a World of Low-Cost 3D Printing*, 42 AIPLA Q.J. 425 (2014); Timothy R. Holbrook & Lucas S. Osborn, *Digital Patent Infringement in an Era of 3D Printing*, 48 U.C. DAVIS L. REV. 1319 (2015); Mark A. Lemley, *IP in a World Without Scarcity*, 90 N.Y.U. L. REV. 460, 471–75 (2015); Lucas S. Osborn, *Regulating Three-Dimensional Printing: The Converging World of Bits and Atoms*, 51 SAN DIEGO L. REV. 553 (2014); Skyler R. Peacock, Note, *Why Manufacturing Matters: 3D Printing, Computer-Aided Designs, and the Rise of End-User Patent Infringement*, 55 WM. & MARY L. REV. 1933, 1934–35 (2014).

97. The existence of centralized repositories is contingent on decentralized, peer-to-peer networks not becoming the norm.

economically questionable suits against end users that are not necessary in the traditional, physical-product economy.

To deal with the altered economics of patent enforcement in a world of democratized 3D printing, patent commentators have proposed a variety of changes to patent law that would shore up patentees' rights. The simplest of these proposals is to treat the creation or sale of executable data files for 3D printers as patentable embodiments of mechanical-device inventions.[98] In fact, this proposal may not require any departure from existing law. An electronic representation of a patentable product that only conveys knowledge about the form of a patented product to a human computer user is not today patentable under the printed matter doctrine.[99] However, an executable data file is a text/component, just like software code in general: it represents the shape of an object to a human interpreter and it is a cog in a deterministic machine that actually makes the object. Thus, if *In re Beauregard* were unquestioningly transposed to data files for 3D printers, then executable data files would seem to be patentable.[100] The proposal to interpret *In re Beauregard* to executable data files would curtail inventors' disclosure obligations, but whether it should be held to impermissibly impinge on the public privilege to disseminate knowledge presents a legitimately contested policy issue.[101] One important technological fact in this debate is the extent

98. Dillon, *supra* note 96, at 452–55. Holbrook and Osborn argue that a sale or offer to sell an electronic, 3D representation should constitute direct infringement, but not the acts of making or using it. Holbrook & Osborn, *supra* note 96, at 1327–28. Daniel Brean goes much further, proposing that electronic representations of patentable 3D objects should be patentable, regardless of whether they are executable data files. Brean, *Patenting Physibles*, *supra* note 96, at 849–53. A related issue has already arisen in the courts: the International Trade Commission asserted jurisdiction over the "importation" of a patented invention in the form of electronic representations of objects entering the United States over the internet, but the Federal Circuit rejected the assertion. ClearCorrect Operating, LLC v. Int'l Trade Comm'n, 810 F.3d 1283 (Fed. Cir. 2015).

99. *See supra* note 76 and accompanying text (noting that the printed matter doctrine applies to electronic representations); *supra* note 92 (noting that a machine being able to display the knowledge represented by the electronic representation to a human does not make the representation into a text/component).

100. *See* Brean, *Patenting Physibles*, *supra* note 96, at 845–47 (stating that a "CAD file distributor has 'made' the claimed invention because the act of storing the digital file on the server created the claimed storage medium with the claimed data on it"); Dillon, *supra* note 96, at 452–55 ("As long as this apparatus is itself a patent-eligible invention (such as a new mousetrap), a Beauregard claim covering its digital design should likewise be patent-eligible."); Osborn, *supra* note 96, at 587 (proposing *Beauregard*-style claims to protect CAD files).

101. One insightful student note invokes inventors' disclosure obligations as a reason to question the patentability of electronic representations of patentable objects. Peacock, *supra* note 96, at 1948 ("The existence of the disclosure requirement could obviate any claim of a proprietary interest an inventor might assert in relation to a CAD containing the schematics for his patented creation.").

to which alternative, nonpatented channels of knowledge transmission remain available to the public if executable data files become patentable. If any electronic representation of the 3D configuration of the patented device can be automatically compiled into an executable data file, then the proposal starts to look like a costly imposition on knowledge dissemination. However, if electronic transmission of the 3D configuration of a patented device can be easily accomplished without the transmitted data file being executable by a 3D printer, then the patentability of executable data files for 3D printers is not much different as a policy matter from the routine patentability of texts/machines under contemporary patent law.[102] Of course, the patent rights granted in this situation do not have significant value if the work needed to transform a 3D representation into an executable data file is minimal and does not require significant programming expertise. This is simply the cost that must be paid to provide reasonable protection for the public privilege to disseminate disclosed knowledge.

2. Old Products Combined with New Texts

The claims that most self-evidently conflict with the public privilege to disseminate disclosed knowledge recite only a tangible medium and a knowledge-bearing representation recorded on it. For example, consider a product claim to printed matter representing a drug's dosage information or a method claim to verbally informing a patient of a drug's dosage information. A more contestable type of claim at the boundary of the public privilege is a combination claim to the representation of disclosed knowledge together with a use of disclosed knowledge in a technological application. For example, consider a product claim to a combination of a bottle of pharmaceutical pills with a label informing a patient that the drug should be consumed in a particular fashion or a method claim reciting the steps of giving the bottle to a patient and informing the patient that the drug should be consumed in a particular fashion.[103]

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102. Daniel Brean's analysis implies that the step moving from a digital representation of an object to an executable file for a 3D printer is significant. Brean, *Patenting Physibles*, *supra* note 96, at 847–48 (discussing the process of "slicing"). Whether or not this step is significant today, however, technological change is likely to make it insignificant tomorrow.

103. For examples of such pills-plus-labels claims, see AstraZeneca LP v. Apotex, Inc., 633 F.3d 1042 (Fed. Cir. 2010); King Pharm., Inc. v. Eon Labs, Inc., 616 F.3d 1267 (Fed. Cir. 2010). Assuming that the conventional technology (i.e., the bottle of pills) is not independently patentable, claims to the combination of the technology and the instructions have value to patent owners for two reasons. First, if the recommended method of use is inherent in the prior art, then the combination claims are likely to be the only form of patent protection available. Second,

Does a claim to a technology in combination with a text representing knowledge about how to use that technology conflict with the public privilege to disseminate disclosed knowledge before patent expiration? As a descriptive matter, the answer today is a firm "yes." The printed matter doctrine has a well-established point-of-novelty or patentable-weight approach for identifying distinction from the prior art. Under most circumstances, the content of the printed matter—that is, the facts and hypotheses that a representation conveys to a human reader—must be ignored when identifying whether a claimed invention is novel and nonobvious in relation to the prior art.[104] If a claim describes a combination of a bottle of pills and a representation of instructions for use, the claim is invalid if the represented knowledge is what differentiates the claim from the prior art.[105]

Opinions applying the patentable-weight approach of the printed matter doctrine usually justify the rule as a policy matter by leaning on the inherency doctrine and noting that the discovery of new knowledge about how an invention works does not allow the technology to be patented again.[106] In a revealing oversight, the opinions do not examine the issue from the perspective of the patentability of disclosed knowledge. Technically, inventors seeking to patent claims to combinations of a prior art technology and instructions for use are not trying to repatent the prior art technology. They are only seeking rights to an improvement in the form of the combination of the prior art technology and the instructions; even if the technology-and-instructions claim is valid, the public is free to continue using the prior art technology as it existed before the combination was invented. Rather than focusing on inherency in their

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if the recommended method of use can be captured in a valid method claim, then the combination claim transforms secondarily liable inducers into direct infringers, reducing the difficulty of proving infringement.

104. *AstraZeneca LP*, 633 F.3d at 1063–65; *King Pharm., Inc.*, 616 F.3d at 1279; *In re* Ngai, 367 F.3d 1336, 1339 (Fed. Cir. 2004). The exception to this rule is when there is a functional relationship between the printed matter and the remainder of the claimed subject matter. *In re* Gulack, 703 F.2d 1381, 1386–87 (Fed. Cir. 1983). The argument that there is a functional relationship between instructions about how to use a drug and the drug has been repeatedly rejected. *In re* Huai-Hung Kao, 639 F.3d 1057, 1072–73 (Fed. Cir. 2011). *But cf. In re* Miller, 418 F.2d 1392, 1396 (C.C.P.A. 1969) (concluding that a false label on a measuring cup that aided the creation of half-recipes had a functional relation to the measuring cup).

105. If the combination claim is novel and nonobvious without consideration of the content of the instructions, then the combination claim is economically irrelevant. The broader claim to the pills is valid, and it gives the inventor all of the rights that he would get from the combination claim (and more).

106. *See In re Ngai*, 367 F.3d at 1339 (noting that anyone could patent products indefinitely if courts accepted claims that simply attach a new set of instructions to a known product); *see also AstraZenaca*, 633 F.3d at 1065 (quoting *In re Ngai*, 367 F.3d at 1339).

policy analysis, courts should instead be focusing on inventors' disclosure obligations. Under what conditions should the dissemination of disclosed knowledge constitute patent infringement?

Again, there is no a priori answer as to whether the structural implications of inventors' disclosure obligations should prohibit the patentability of human-readable, instructional texts when those texts are claimed in combination with the technologies that the texts teach readers how to use more effectively. On the one hand, technology-and-instructions claims do interfere with the dissemination of disclosed knowledge to some degree. The interference is limited in that the disclosed knowledge can still be freely disseminated so long as it is not packaged with the technology that it teaches a reader how to use. However, even this limited interference may be significant because it complicates the dissemination of knowledge to the very end users of a technology who could derive the greatest benefit from the knowledge. Yet, on the other hand, technology-and-instructions claims seem like an effective way of crafting claims that are proportional to inventors' contributions to technological progress and providing some incentive to researchers who only create new knowledge. To understand this side of the debate, it is important to emphasize two points about the limited costs of technology-and-instructions claims, as well as a third point about their significant benefits. First, technology-and-instructions claims do not significantly impede competitors who seek to develop design-arounds and improvements because the competitors are motivated to avoid infringement simply by obtaining the knowledge-conveying instructions and the prior art technologies from different sources. Second, technology-and-instructions claims are targeted at the end users of a technology who seek to use the technology in the manner that the patentee envisions, because end users who do not value the disclosed use can presumptively obtain the technology alone, without either the instructions or the patent premium. Third, technology-and-instructions claims would plug a hole in patent protection that denies all protection to researchers who discover new knowledge about already existing products.[107] Yet, despite their relatively low cost and non-negligible benefit, the idea that instructions to human users can constitute an advance over the prior art that renders a claim patentable has, to date, run against the grain of intuitive conceptions of inventors' disclosure obligations and the public privilege to disseminate disclosed knowledge. The social value of the public's ability to freely disseminate representations of disclosed knowledge has carried the day.

107. *See supra* note 103 (discussing motivations for drafting pills-plus-labels claims).

3. Inducement by Dissemination

The public privilege to disseminate disclosed knowledge allows dissemination with an intent of commercial profit. For example, a company can pay a researcher to identify and explain technology disclosed in competitors' biotechnology patents, and the researcher is not liable for patent infringement. A more contestable issue arises when the dissemination is performed with an intent to induce infringement. For example, what if the researcher obtains his paying job of explaining patented technology by informing the company that it would benefit from manufacturing the biotech drug claimed in the patent? Or, what if an architect sells blueprints to a contractor detailing how to construct an infringing curtain wall with an intent of encouraging the contractor to build the infringing curtain wall?

As a doctrinal matter, this contestable issue boils down to an unresolved question about the reach of patent law's active inducement doctrine codified in § 271(b).[108] Neither the researcher nor the architect has directly infringed a patent in the above scenarios,[109] but the open question is whether each can be liable for inducing someone else's act of direct infringement. Inducement has two requirements. First, the inducer must cause, urge, encourage, or aid someone to commit infringement with knowledge that the induced acts constitute patent infringement.[110] Active inducement cannot be committed through inaction; it requires an affirmative act of some kind.[111] Second, the induced party must actually engage in directly infringing conduct.[112] In a typical inducement allegation, the alleged inducer sells a tangible, multipurpose good to a customer and urges the customer to use the good in an infringing manner.[113] The question at the periphery of the public privilege to disseminate disclosed knowledge confronting our biotech consultant and architect arises when the alleged inducer's only conduct is the dissemination of the

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108. 35 U.S.C. § 271(b) (2012).

109. Neither has made, used, sold, offered to sell, or imported the patented invention, which presumptively is the drug or the curtain wall. *See* 35 U.S.C. § 271(a) (2012) (defining direct infringement). Both have made and sold representations of the knowledge disclosed in patents, but any claims to such representations that might be sought interfere with the core of the public privilege to disseminate knowledge and are thus invalid under the printed matter doctrine. *See supra* notes 74–81 and accompanying text.

110. Global-Tech Appliances, Inc. v. SEB S.A., 563 U.S. 754, 766 (2011).

111. *Id.* at 760; Tegal Corp. v. Tokyo Electron Co., 248 F.3d 1376, 1378–79 (Fed. Cir. 2001).

112. Limelight Networks, Inc. v. Akamai Techs., Inc., 134 S. Ct. 2111, 2119 (2014).

113. *See, e.g.*, Arthrocare Corp. v. Smith & Nephew, Inc., 406 F.3d 1365, 1376–77 (Fed. Cir. 2005) (holding that the instructions for surgical probes sold by the defendant induced users to use the probes in an infringing manner).

knowledge disclosed in a patent—no material good is sold—with an intent that the disclosed knowledge lead the knowledge recipient to infringe the patent's claims. In other words, assuming the requisite intent, can the dissemination of disclosed knowledge be an affirmative act on which active inducement liability can rest?[114]

As a descriptive matter, the answer is today unclear. One prominent treatise cites cases establishing that the commercial dissemination of information, standing alone, cannot be the act that supports active inducement, regardless of the disseminator's intent.[115] By limiting the rights of the owner of a valid patent, these cases suggest a robust interpretation of the public privilege to disseminate disclosed knowledge prior to patent expiration. However, a number of older cases that have never been expressly overruled suggest that the dissemination of instructions or plans that instruct a user how to infringe can support inducement liability if the dissemination is performed with the requisite intent.[116]

As a policy matter, the reach of inducement liability into the dissemination of disclosed knowledge once again pits the costs of curtailing the flow of disclosed knowledge against the costs of reducing innovation incentives.[117] An open empirical question about the availability of other channels of dissemination should lie at the foundation of the debate. How much, and what types of, knowledge dissemination in our market economy would be impeded or more costly if knowledge dissemination, standing alone, were to give rise to inducement liability when performed with the requisite intent? Importantly, the answer to this question may shift over time with the rise of the digital economy. For example, the rise of 3D printing and

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114. Infringement liability can also arise under contributory infringement, which, like inducement, is a type of secondary liability. However, unlike inducement, contributory infringement does not give rise to a contested issue on the periphery of the public privilege to use disclosed knowledge itself during the patent term. Contributory infringement requires the sale of a "component." 35 U.S.C. § 271(c) (2012). In a similar context, the Supreme Court has implied that the sale of blueprints (and, presumptively, any representation of knowledge) is not the sale of a component. Microsoft Corp. v. AT&T Corp., 550 U.S. 437, 450 (2007).

115. 5 DONALD S. CHISUM, CHISUM ON PATENTS § 17.04(4)(g) (Matthew Bender ed., 2015) ("Publication of information about a patented product or method does not constitute active inducement unless accompanied by other activity, such as sale of material capable of an infringing use.").

116. *See, e.g.*, Toppan v. Tiffany Refrigerator Car Co., 39 F. 420, 421 (C.C.N.D. Ill. 1889) (holding defendant's act in furnishing his licensees with plans and drawings showing the device from plaintiff's patent supported liability).

117. If there is no inducement liability, patent owners may still sue direct infringers. However, a large number of suits against individual infringers is often not economically rational, so the absence of inducement liability may mean no enforcement at all. *See supra* notes 96–97 and accompanying text (discussing the effects of 3D printing on patent enforcement).

its disruption of the traditional economics of patent enforcement[118] are putting pressure on the issue of inducement by knowledge dissemination. While there are some disagreements over the conditions under which direct infringement does and could arise, scholars who have addressed the issue uniformly assume that the dissemination of an electronic, 3D representation of a patented object, standing alone, can give rise to inducement liability if it is performed with an intent to induce infringement.[119] This outcome, however, assumes away the contested question of whether trafficking in disclosed knowledge, standing alone, is an act that can give rise to liability for infringement or, alternatively, whether it is part of the public privilege to disseminate disclosed knowledge.

B. Cognition

The public privilege to use disclosed knowledge itself prior to patent expiration is not only a privilege to disseminate that knowledge. It includes some mental, cognitive uses of that knowledge, too. More specifically, descriptions of the privilege commonly reference two distinct mental acts: the act of *understanding* the disclosed knowledge[120] and the act of *creative cognition* that employs the disclosed knowledge as an input and yields the conception of a design-around or improvement technology as an output.[121]

Claims that interfere with the core of the public privilege to understand disclosed knowledge and use it in creative cognition are not as common as claims that interfere with the core of the public privilege to disseminate disclosed knowledge, but they are still feasible. With respect to understanding, the simplest, brute-force approach would be with a method claim that recites the act of

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118. *See supra* notes 93–94 and accompanying text.

119. Brean, *It's No "Use,"* *supra* note 96, at 793–96; Dillon, *supra* note 96, at 444–47; Holbrook & Osborne, *supra* note 96, at 1343–44. For a discussion of direct infringement by electronic, 3D representations, see *supra* notes 98–102 and accompanying text.

120. The act of understanding disclosed knowledge can also be viewed as part of the public privilege of dissemination: ensuring the free flow of texts is meaningless if readers do not have a privilege to understand the knowledge that the texts represent.

121. *See supra* notes 38–48 and accompanying text. Design-arounds and improvements are different. Someone who is inspired by a patented technology and conceives of a new technology can make and use the new technology without the permission of the patent owner if the technology is a design-around, but not if it is within the scope of the claims of the original patent and thus an improvement. In the context of the inventive cognition that forms part of the public privilege to use disclosed knowledge itself, however, this difference is irrelevant. In this context, the focus is not on the use of the new technology but rather on the process of conceiving the new technology. Inventive cognition should fall within the public privilege to use disclosed knowledge itself even if it yields an improvement rather than a design-around.

comprehending the disclosed knowledge.[122] So, for example, if a researcher discovers that patients taking a particular drug who have metabolite levels below a certain concentration are likely not receiving the therapeutic benefit of a drug,[123] he could attempt to claim a method of understanding that a metabolite level below that concentration correlates with the drug being therapeutically ineffective. With respect to creative cognition, however, it is more difficult to formulate an effective claiming technique. The outputs of the creative cognition are not known before the creative cognition occurs, so drafting claims that describe the mental use of disclosed knowledge to reach specific design-arounds or improvements is impossible. In addition, claims generically claiming creative cognition using the disclosed knowledge without reciting the output as a limitation are almost certainly invalid for overbreadth. However, because creative cognition necessarily uses the disclosed knowledge as an input, the brute-force understanding claim discussed above also encompasses the creative cognition involved in conceiving design-arounds and improvements.

There has been surprisingly little case law addressing the limits on the patentability of cognition in human minds over the last several decades. The Supreme Court has repeatedly identified mental processes as patent-ineligible subject matter under § 101,[124] but it has never directly addressed the mental-process exclusion by invalidating or upholding a claim to a mental process while expressly presenting the mental-process exclusion as its rationale. Nonetheless, given current Federal Circuit law, it is safe to assume that § 101 is doing most, if not all, of the work needed to safeguard the core of the public privilege to use disclosed knowledge itself from cognition claims.[125] Raw claims to understanding disclosed knowledge—or, in fact, any method claims reciting only cognitive-process limitations—are clear

122. A product claim to the brain state that supports the act of understanding is also theoretically possible, but it is yet more farfetched as a practical matter.

123. *Cf.* Mayo Collaborative Servs. v. Prometheus Labs., Inc., 132 S. Ct. 1289, 1294–95 (2012) (addressing diagnostic claims premised on a similar newly discovered correlation).

124. *Id.* at 1293; Gottschalk v. Benson, 409 U.S. 63, 67 (1972).

125. The Federal Circuit tends to enforce the patent-ineligibility of human cognition by citing the abstract ideas exclusion. *In re* BRCA1- and BRCA2-Based Hereditary Cancer Test Patent Litig., 774 F.3d 755, 763–65 (Fed. Cir. 2014) (describing the mental comparison of BRCA sequences as a patent-ineligible abstract idea). The Federal Circuit frequently discusses the exclusion of mental processes from patent eligibility in the context of software-executed inventions. *E.g.*, CyberSource Corp. v. Retail Decisions, Inc., 654 F.3d 1366, 1371–73 (Fed. Cir. 2011). However, these cases do not implicate the patentability of human cognition. Rather, they implicate the patentability of software-executed processes that could, in the alternative, be performed by a human mind.

cases of patent-ineligible subject matter under § 101 today.[126] Recent developments at the Federal Circuit strongly suggest that claims to combinations of mental steps and extramental steps (the latter of which are often called "physical" or "tangible" steps) are not patent eligible, either, at least if the limitations reciting the extramental steps encompass the prior art, and the sole point of novelty thus resides in the understanding steps.[127] In other words, these developments suggest that a variant of the point of novelty or patentable-weight approach to distinction over the prior art employed in the printed matter doctrine now also applies to method claims reciting understanding steps as well.[128] Thus, continuing the example above, a claim to a two-step method of, first, determining the metabolite level in a patient's blood and, second, understanding that, in general, a metabolite level below that concentration correlates with the drug's therapeutic inefficacy would likely be patent ineligible if the step of determining the metabolite level were in the prior art because the novel understanding step would not be given patentable weight.

From the perspective of enforcing inventors' disclosure obligations, the use of the patentable-weight analysis in assessing the patentability of claims reciting understanding steps is good policy. In fact, it is more essential in the context of cognition claims than it is in the context of printed matter claims. When printed matter claims are at issue, the decision to make, use, or sell representations of printed instructions is the result of a volitional act, so technology users can opt not to use the instructions-and-prior-art combination and to use only the prior art technology instead.[129] In contrast, basic cognitive

126. Ass'n for Molecular Pathology v. U.S. Patent & Trademark Office, 689 F.3d 1303, 1334–35 (Fed. Cir. 2012), *rev'd on other grounds sub nom.* Ass'n for Molecular Pathology v. Myriad Genetics, Inc., 133 S. Ct. 2107 (2013). As was true with the core dissemination claims, there are few litigated cases today involving core cognition claims. Applicants know that they will not successfully obtain such claims, so they do not draft them in unambiguous terms in the first place.

127. *In re BRCA1*, 774 F.3d at 763–65 (interpreting *Mayo*, 132 S. Ct. at 1295–97 to require this result). Before the Supreme Court's opinion in *Mayo v. Prometheus*, the Federal Circuit had not reached this conclusion. Prometheus Labs., Inc. v. Mayo Collaborative Servs., 628 F.3d 1347, 1358–59 (Fed. Cir. 2010), *rev'd*, 132 S. Ct. 1289 (2012).

128. *See supra* notes 104–105 and accompanying text (discussing the patentable-weight approach of the printed matter doctrine). When cognition claims are at issue, the patentable-weight approach is today being administered as an "inventive concept" analysis. *In re BRCA1*, 774 F.3d at 759, 763–65. Yet, the effect of the inventive-concept analysis of patent eligibility on cognition claims is roughly the same as the effect of the patentable-weight approach in the printed matter doctrine on representation claims, at least in most cases. Kevin Emerson Collins, Prometheus Laboratories, *Mental Steps, and Printed Matter*, 50 HOUS. L. REV. 391, 402 (2012).

129. *See supra* note 106 and accompanying text (noting that potential infringers can opt to use the prior art rather than a combination of the prior art and printed instructions).

acts like understanding are nonvolitional.[130] Once someone has been exposed to the disclosed knowledge, for example by reading a patent specification, he cannot help but understand the disclosed knowledge. If claims like the two-step determine-and-understand claim presented above were valid, the public would have to avoid using prior art technologies in order to be able to freely exercise its privilege to read, understand, and think about the knowledge disclosed in a patent. Forcing the public to elect to either use prior art technologies or exercise their privilege to use disclosed knowledge itself deprives the public of its end of the bargain under the quid pro quo of disclosures for exclusive rights.[131] Therefore, invalidating determine-and-understand claims is essential, and a patentable-weight approach to the eligibility of understanding claims is the most effective way of doing so.

Moving beyond core cases, a contestable issue at the periphery of the public privilege to use disclosed knowledge itself in cognition that has been repeatedly litigated over the last decade involves medical diagnostic claims based on newly discovered correlations. In fact, in *Mayo Collaborative Services v. Prometheus Laboratories*, the Supreme Court addressed the patent eligibility of a diagnostic claim based on the very correlation in the hypothetical claims considered above—namely, a correlation between patients' metabolite levels being below a certain level and patients' drug dosages likely being therapeutically ineffective.[132] With some allowances for simplification, the *Mayo* claim recited a two-step method of, first, determining the metabolite level in a particular patient's blood using a prior art test and, second, inferring that a metabolite level below a certain concentration means that that particular patient's drug dosage is ineffectively low.[133] No actual modification of the patient's drug dosage was required for infringement. The only important difference between the two-step, hypothetical claim described above[134] and the *Mayo* claim resides entirely within the second, cognition step. In the

130. Kevin Emerson Collins, *Constructive Nonvolition in Patent Law and the Problem of Insufficient Thought Control*, 2007 WIS. L. REV. 759, 794–96.

131. *Id.* at 806–12; *see also* Dmitry Karshtedt, *Photocopies, Patents, and Knowledge Transfer:* The Uneasy Case *of Justice Breyer's Patentable Subject Matter Jurisprudence*, 69 VAND. L. REV. 1739, 1774–75 (2016).

132. *Mayo*, 132 S. Ct. at 1294–95. *Mayo* also involved a claim based on the related correlation between patients' metabolite levels being above a different level and patents' drug dosages being so high that the risk of toxicity-related side effects is significant. *Id.*

133. The claims before the Supreme Court also recited an initial step of administering the drug to a patient. *Id.* at 1295.

134. *See supra* note 128 and accompanying text (presenting this hypothetical two-step method claim).

hypothetical, patent-ineligible claim, the cognition step encompasses a doctor's mental act of understanding that the correlation exists in patients' blood streams in general. In the actual *Mayo* claim, the cognition step more narrowly encompasses an applied act of syllogistic reasoning in which a doctor uses his knowledge of the general correlation in a diagnostic inference that yields clinically useful knowledge about her patient in particular.[135] In other words, the litigated claim was not a determine-and-understand claim but rather a determine-and-infer claim.[136]

Whether the determine-and-infer claim actually at issue in *Mayo* is a patent-ineligible claim to a mental process has not yet been decided in the courts. Although the Supreme Court invalidated the *Mayo* claim, it did not address the mental process issue.[137] Rather, the question on which the Supreme Court accepted certiorari and on which it focused in its opinion was whether the *Mayo* claim directed to a patent-ineligible "law of nature" in the abstract.[138] One consequence of paying attention to the structural implications of inventors' disclosure obligations in a more rigorous manner is that the mental-process issue lurking just under the surface in the *Mayo* opinion, and other opinions framing medical-diagnostic claims as claims that implicate patent-ineligible laws of nature, comes to the surface. These cases are no longer cases simply identifying the limits that nature imposes on patent protection. They are rather cases identifying the limits that human cognition imposes on patent protection due to inventors' disclosure obligations. In turn, this reframing offers an opportunity to both alter the limits on patent protection imposed in

135. Collins, *supra* note 4, at 1338–39.

136. The narrow nature of the claimed inference—addressing a particular level of a particular metabolite of a particular drug in a particular patient—has made the *Mayo* claim less controversial than other claims that encompass much broader swaths of reasoning. For an example of a far more expansive and controversial determine-and-infer claim, see Classen Immunotherapies v. Biogen IDEC, 659 F.3d 1057 (Fed. Cir. 2011). However, the difference between the *Mayo* and *Classen* claims is important only if the underlying normative problems derive from claim breadth, as they do when overbreadth and preemption are the primary concerns. When, as here, the underlying problem is private control over mental cognition employing the knowledge disclosed in a patent, the differences between claims following the *Mayo* and *Classen* templates are not important.

137. The Federal Circuit did address the mental process issue in the *Mayo* claims, but it did so under § 101 doctrine that is now outdated because it failed to employ a patentable-weight, or inventive-concept, approach. Prometheus Labs., Inc. v. Mayo Collaborative Servs., 628 F.3d 1347, 1358–59 (Fed. Cir. 2010), *rev'd*, 132 S. Ct. 1289 (2012).

138. *Mayo*, 132 S. Ct. at 1297–98.

these cases and tie those limits to the firmer policy mooring provided by the public-knowledge theory of the disclosure.[139]

Putting contemporary doctrine to one side, should the public privilege to use disclosed knowledge itself include a privilege to engage in the *Mayo* claim's diagnostic method? Should the shift from a raw understanding step in a determine-and-understand claim to a focused inference step in a determine-and-infer claim be enough of a difference to impart patent-eligibility? On the one hand, a robust conception of the public privilege would take Rosenberg's statement that "anyone is free to think . . . about what is covered by the patent without trespassing upon the exclusive right of the patentee" seriously and frame the *Mayo* claims as wily tricks with which inventors attempt to privatize the very resource that their disclosure obligations demand that they publicize.[140] Both understanding and inference steps are purely mental activities, and perhaps the public privilege to use disclosed knowledge itself prior to patent expiration includes all acts of logical, human reasoning that employ the disclosed knowledge as an input, even if those mental acts are performed in conjunction with prior art technology. On the other hand, a more tailored conception of the public privilege would only embrace the core acts of understanding disclosed knowledge and conceiving creative design-arounds and improvements. Under this parsimonious conception of the privilege, claims to novel acts of diagnostic reasoning do not allow inventors to escape their disclosure obligations. The public can read a patent disclosing a newly discovered correlation, think about that correlation, speculate about why the correlation exists, posit new hypotheses about how metabolic processes work, and design new experiments to test those hypotheses, all without infringing a determine-and-infer claim like the *Mayo* claim.[141] Some way of dealing

139. Rather than switching from a nature-based limit on patent protection to a mind-based limit, another possibility is to layer the proposed mind-based limit on top of the existing nature-based limit that structures the Supreme Court's reasoning in its *Mayo* opinion. The infirmities of the nature-based reasoning, however, weigh in favor of switching rather than layering. *See* Collins, *supra* note 4, at 1335–37 (illustrating the problems that follow from taking *Mayo*'s analysis of patent-ineligible "law of nature" at face value).

140. ROSENBERG, *supra* note 43, at 10.

141. In theory, even a single-step claim to just the inference step, without the extramental determining step, would be permissible under this narrower conception of the public privilege to use disclosed knowledge itself. Nonetheless, such a single-step inference claim would be patent-ineligible under the contemporary mental-process exclusion because it recites a purely mental process. *See supra* note 126 and accompanying text (arguing that claims to understanding disclosed knowledge as are clearly patent-ineligible). Today's mental-process exclusion is thus doing more than protecting a thin implementation of the public privilege to use disclosed knowledge itself. It may be partially protecting a thicker implementation of the privilege, extending the privilege to encompass all human cognition enabled by disclosed knowledge, not

with the nonvolition problem is still required for claims in the mold of the *Mayo* claims to coexist with the public privilege even in its narrower form,[142] but this can be accomplished through means less drastic than invalidating all claims that follow the template of the *Mayo* claims.[143]

CONCLUSION

Public-knowledge disclosure theory usually focuses exclusively on the benefits of the publicly available knowledge that an inventor is obligated to disclose, and it overlooks structural implications of inventors' disclosure obligations for the reach of patentees' rights. If patents are to ensure a public privilege to use disclosed knowledge itself during the term of a patent, there must be corresponding restrictions on patentees' rights that prohibit private control over the very activities that constitute the public privilege. The Patent Act's provisions that establish the permissible reach of patentees' rights must be interpreted in a structural manner in light of § 112(a), and the duality of claiming and disclosing that forms the deep structure of the Patent Act, in order to safeguard the public privilege.

There are two principal consequences of openly recognizing the structural implications of inventors' disclosure obligations. First, in many core cases, contemporary patent doctrine already enforces the needed limits on patentees' rights. Here, recognition improves the conceptual coherence of patent law and removes the risk that important limitations on patentees' rights will be abandoned or interpreted narrowly due to doctrinal chaos or a lack of statutory grounding. Second, in cases at the periphery of the privilege, acknowledging the structural implications of inventors' disclosure obligations may impact patent law's public/private balance by highlighting the cost of allowing patent protection to reach further into the acts of knowledge dissemination and creative cognition that employ the knowledge as an input.

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simply the creative cognition required for conceiving design-arounds and improvements. Or, it may be implementing a normative justification other than enforcement of inventors' disclosure obligations. Kevin Emerson Collins, *Patent-Ineligibility as Counteraction*, 94 WASH U. L. REV. (forthcoming 2017) (manuscript at 18–44), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2748288 [https://perma.cc/R4SW-5M3H].

142. *See supra* notes 130–131 and accompanying text.

143. Collins, *supra* note 130, at 774–90 (laying out a constructive non-volition defense to patent infringement); Karshtedt, *supra* note 131, at 1783–84 (same).