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Kevin Emerson Collins
Indiana University School of Law

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CONSTRUCTIVE NONVOLITION IN PATENT LAW AND THE PROBLEM OF INSUFFICIENT THOUGHT CONTROL

KEVIN EMERSON COLLINS*

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I. INTRODUCTION

Researchers regularly discover unexpected correlations. For example, here is an entry in the "Who knew . . . ?" annals of medicine: gum disease is a risk factor that doctors can use to predict cardiovascular disease.1 Perhaps even more unexpected than these correlations themselves, however, is the patent protection that seems to be available under the contemporary patent regime for the researchers who discover them. Here is the corresponding entry in the "What if . . . ?" annals of patent law: had the researchers who first discovered the correlation between gum disease and cardiovascular disease been patent savvy, they could have claimed a useful and nonobvious method of assessing cardiovascular health. They could have sought rights to exclude others from performing the following two acts in succession: (1) examining a patient's gums and (2) correlating the presence (or absence) of gum disease with an increased (or not-increased) risk of cardiovascular disease.

These hypothetical patent rights are troubling because of a confluence of distinct concerns about excessive legal and insufficient willful control over thought. On the one hand, the cardiovascular-risk claim propertizes thought. It sanctions a form of private, negative thought control: it grants a patentee a legal right to exclude others from a method in which the only contribution that the patentee makes to progress is an act of mental cognition about information that the patentee disclosed to the public in the patent specification.2 The propertization of thought may take the property generated by the patent regime too far; it may create a problem of excessive legal control over human thought. On the other hand, the hypothetical claim is particularly troubling even in relation to other thought-propertizing claims because potential infringers cannot control their own potentially infringing thoughts. The recited act of correlating is reflexive.3 When people say that their minds "jump to logical conclusions," they do not

2. See Kevin Emerson Collins, 60 SMU L. REV. 317, 329–35 (2007) (defining a thought-propertizing claim). To follow standard patent law terminology, this Article refers to mental processes as "acts" despite the fact that action is sometimes defined in opposition to thought.
3. This Article refers to involuntary cognition as a reflexive "act." This usage does not follow the usage of "act" in some legal discourse wherein the existence of an act entails voluntariness. See H.L.A. HART, PUNISHMENT & RESPONSIBILITY 98 (1968) (quoting Austin's Lecture XVIII); OLIVER WENDELL HOLMES, JR., THE COMMON LAW 54 (1946).
understand the process to involve one part of the mind—the will—
instructing another part to jump. Combined with the fact that patent
infringement is a “strict liability” cause of action, the reflexive nature
of a claimed act of thinking seems to put the law-abiding public that
wants to avoid patent infringement in a bind. Strict liability means that
a defendant’s innocence and lack of intent to infringe are legally
irrelevant, and a defendant who performs the steps of a method claim
is therefore routinely held per se liable for patent infringement. If strict
liability is narrowly construed in this fashion, the only way that a
dentist can avoid performing the method described above is to avoid
looking inside a patient’s mouth. The dentist cannot help but perform
the reflexive correlating step if he or she reads about the link between
gum and heart disease and then sees the patient’s gums. In sum, the
claim is potentially troubling not merely because it is a thought-
propertizing claim, but also because it is a reflexive-thought-
propertizing claim.

Although the dentist hypothetical may seem far-fetched, reflexive-
thought-propertizing claims that follow its basic template are routinely
allowed under the contemporary patent regime. The Patent and
Trademark Office (“PTO”) issues “test and correlate” patent claims, and
the Supreme Court was cued up last term to address the validity of
such a claim in Laboratory Corp. of America Holdings v. Metabolite

U.S. 627, 645 n.5 (1999) (“infringement may be entirely inadvertent and unintentional
and without knowledge of the patent”) (quoting 5 DONALD S. CHISUM, CHISUM ON
17, 35 (1997) (neither the doctrine of equivalents nor literal infringement requires a
showing of intent to infringe); Mitchell v. Hawley, 83 U.S. 544, 550 (1872)
(“innocent” infringement is still infringement). However, knowledge of a patent and
intent to infringe may affect the availability of damages, 35 U.S.C. § 287(a) (2000)
(marketing and notice requirements), the amount of damages available, id. § 284; Lam,
Inc. v. Johns-Manville Corp., 668 F.2d 462, 474 (10th Cir. 1982) (providing for treble
damages in some cases of willful infringement), and the existence of contributory
infringement, 35 U.S.C. § 271(c) (requiring knowledge of the patent for contributory
infringement). Cf. Roger D. Blair & Thomas F. Cotter, Strict Liability and Its
infringement works on a modified strict liability regime because notice and marking
affect the remedies available to a patentee upon a finding of infringement).
6. The experimental use doctrine is an exception to this general rule. See
Madey v. Duke Univ., 307 F.3d 1351, 1362 (Fed. Cir. 2002) (discussing the
experimental use exception to strict liability for uses that are “solely for amusement, to
satisfy idle curiosity, or for strictly philosophical inquiry”). This Article uses the phrase
“liable for patent infringement” to refer to the status of being an infringer, not the
narrower status of being monetarily liable for damages.
7. See infra note 139 (discussing “test and correlate” claims).
Laboratories, Inc. before the Court dismissed the writ of certiorari as improvidently granted. Like the gum-disease hypothetical, the claim at issue in Laboratory Corp. was premised on the discovery of an unexpected correlation in human blood: a high level of one chemical, the amino acid homocysteine, corresponds to a deficiency of a second chemical, vitamin B12. Continuing the parallel, the Laboratory Corp. claim recited a two-step method of diagnosing a vitamin B12 deficiency: (1) testing a patient’s homocysteine level and (2) correlating the presence (or absence) of an elevated level of homocysteine with the presence (or absence) of a vitamin B12 deficiency. Prior to the discovery of the correlation, some homocysteine tests were in the public domain. After the discovery, however, all doctors who ordered homocysteine tests performed the claimed method because knowledge of the homocysteine–vitamin B12 correlation was widespread and no doctor could avoid performing the inventive, reflexive act of correlating after having viewed the results of a homocysteine test. If strict liability is construed as per se liability for performing the claimed method, a doctor must avoid ordering a homocysteine test in order to avoid performing the claimed method.

This Article isolates and analyzes the problem that an individual’s inability to control reflexive thoughts creates for the patent regime. It does so by bracketing important questions about thought-propertizing claims in general, including the normative question about whether they should be held to recite patentable subject matter under section 101 of the Patent Act. It narrows the focus in this fashion in part to drill down and address one aspect of the Laboratory Corp. case in an analytically precise manner. However, it takes this approach in part also to branch out and demonstrate that the problem isolated by drilling down is not specific to claims involving reflexive acts of thinking. Strategically, this Article looks to a problem that surfaces most plainly

9. To minimize technical jargon, this description simplifies the correlation. For a more precise description, see infra note 98.
10. Laboratory Corp. addressed the indirect liability of a company that sold homocysteine tests, but this Article focuses on the direct liability of the doctors who ordered the tests. See infra note 175 (noting that a defendant’s indirect liability cannot exist without a third party being directly liable).
11. This Article assumes for the sake of argument that thought-propertizing claims recite patentable subject matter. For analysis of whether the patent regime should permit the propertization of thought in general, see Collins, supra note 2, at Part III.B–C (considering two doctrinal approaches to assessing the patentability of thought-propertizing claims under section 101); Kevin Emerson Collins, Propertizing Thought: Efficiency, Autonomy and Personhood (unpublished manuscript, on file with the Wisconsin Law Review) (exploring the normative problems attendant to the propertization of deliberate thought).
at or just beyond the periphery of the realm of traditionally patentable subject matter in order to better understand the center of that realm.

Substantively, this Article proposes and defends a *constructive-nonvolition* exemption from patent infringement. It argues that strict liability in patent law should not mean absolute liability for using a technology covered by a valid patent claim. It pries the factual issue of appropriating the entitlement delineated by a patent claim (i.e., using a claimed technology) apart from the legal issue of infringing the patentee's rights. Constructive nonvolition allows a court to identify the situations in which the defendant's choice set is unduly restricted and his or her control over the use of a patented technology is therefore insufficient to justify the imposition of liability. More specifically, it focuses on the cost that the hypothetical defendant who wants to respect patent rights must incur in order to avoid infringement or reduce the benefit received from the patented technology. If in order to reduce that benefit a defendant must abandon valued privileges that exist in either the prior art or more broadly a possible world in which the patented technology is never invented, then constructive nonvolition exists, and the defendant should not be liable. For example, if in order to avoid performing the method of cardiovascular risk assessment discussed above, a dentist must avoid looking into patients' mouths and therefore forego a career as a dentist, then the dentist’s performance of the claimed method is a constructively nonvolitional appropriation of the patent entitlement that should not amount to patent infringement. Similarly, a doctor who must avoid ordering homocysteine tests (for valued purposes other than diagnosing a vitamin B12 deficiency) is a constructively nonvolitional appropriator if he performs the claimed method at issue in *Laboratory Corp*.  

To clarify what constructive nonvolition is, it is useful to emphasize several things that constructive nonvolition is not. First, constructive nonvolition does not involve a direct translation into patent law of the exemption from liability for nonvolitional acts that exists in the strict liability regimes of criminal law, trespass, and copyright. Constructive nonvolition is to nonvolition as constructive notice is to notice: it identifies the conditions under which the law should treat a defendant as a nonvolitional actor regardless of whether the defendant

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12. Although this Article uses strict liability as a framing device, constructive nonvolition is an exemption from all liability from infringement, not merely from the strictness of strict liability that catches innocent actors. Even if the doctor/dentist knows of the existence of the patent, realizes that the conduct will lead to the performance of the claimed method and intentionally engages in that conduct, the doctor/dentist may still act in a constructively nonvolitional fashion.
acted volitionally as a factual matter. Second, constructive nonvolition does not presume an invalid or impermissibly overbroad patent claim. Patent law’s invalidity doctrines prohibit claims that literally encompass more technology than an inventor has actually invented, and these invalidity doctrines are conventionally presumed to be the only bulwark that is required to avoid patent damages that overreward an inventor and that unfairly or inefficiently tax the public. Constructive nonvolition challenges the sufficiency of this bulwark. It does not raise the problem of too many embodiments of a technology being included within the descriptive figure of a patent claim. It raises the problem of inadequate noninfringing options remaining for a defendant in the undescribed ground outside of that figure. Third, constructive nonvolition is a defense that is available only to a subset of alleged infringers. It does not necessarily imply that a patentee looses his or her in rem rights.

To demonstrate that constructive nonvolition is a concept of general applicability in patent law, Part II explains constructive nonvolition without reference to reflexive-thought-propertizing claims. It uses the Federal Circuit Court of Appeals’ recent opinions in SmithKline Beecham v. Apotex and the Canadian Supreme Court’s recent opinion in Monsanto v. Schmeiser to illustrate and explain a constructive-nonvolition exemption to direct infringement.

The remainder of this Article then brings the newly minted concept to bear on reflexive-thought-propertizing claims. Part III initially defines a thought-propertizing claim. After illustrating the reflexive nature of some acts of thinking, it then argues that reflexive-thought-propertizing claims raise the same problem of constructive nonvolition that exists in all of patent law and that they do so in spades. It also differentiates between claims to freestanding, reflexive acts of thinking,

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13. It is dubious whether the nonvolition exemption in other areas of the law is ever a straight-up issue of fact rather than a legal conclusion designed to achieve policy goals. See, e.g., infra notes 82, 86. More generally, the scope of liability in a strict liability regime is often analyzed as a matter of policy. See, e.g., Guido Calabresi & Jon T. Hirschoff, Toward a Test for Strict Liability in Torts, 81 Yale L.J. 1055, 1060 (1972) (discussing the role of the cheapest cost avoider in defining the limits of strict liability in tort).

14. If it is likely that a significant percentage of the potential alleged infringers of a particular claim will be constructively nonvolitional appropriators, then it might be reasonable to invalidate the claim up front and avoid the fact-intensive and costly procedure of sorting the infringers from the constructively nonvolitional appropriators. The question pertaining to claim invalidity, however, is a second-order question that can be addressed only after the defense of constructive nonvolition is established. See infra text accompanying note 208.

15. See infra note 52.

where the constructive-nonvolition problem is self-evident, and claims to irrevocable bundles like the claim at issue in *Laboratory Corp.*, where the constructive-nonvolition problem may often be more difficult to recognize.

Part IV focuses on claims to irrevocable bundles in general and on the *Laboratory Corp.* claim in particular. With respect to claims to irrevocable bundles, it demonstrates that courts may afford patentees protection that is both economically and constitutionally overbroad when they equate strict liability with absolute liability and that recognition of a constructive-nonvolition exemption trims off the overbreadth. Bringing this analysis to bear on the lower court proceedings in *Laboratory Corp.*, it draws two lessons. First, it argues that the lower courts granted Metabolite overbroad protection because they failed to identify all of the constructively nonvolitional appropriators. Second, it brings into sharp focus the intricacy of the factual analysis that may frequently be required to sort defendants who are infringers of reflexive-thought-propertizing claims from those who are constructively nonvolitional appropriators.

II. STRICT LIABILITY AND CONSTRUCTIVE NONVOLITION

This Part argues that courts should recognize a constructive-nonvolition exemption from liability for patent infringement. The first Section identifies two consensus principles that animate most normative justifications of patent law. The second Section argues that strict liability for patent infringement can violate both of these principles if courts equate strict liability with absolute liability but not if courts recognize a constructive-nonvolition exemption from patent infringement.

A. Two Minimalist, Consensus Principles of Patent Policy

Two basic principles form a backstop for the justifiable extent of patent protection. The reward principle holds that the inventor’s reward must be only a fraction of the welfare benefit attributable to the technology that the inventor actually invented. The baseline principle is a negative corollary of the reward principle: the public should not be made worse off by the development of a technology and its patenting than it would have been had the invention never been invented at all.

These two principles identify a normative least common denominator. Crafted in response to both efficiency- and fairness-oriented justifications of patent law, they describe characteristics shared
by most visions of what patent protection should be (provided, of course, that patent protection should exist at all).\textsuperscript{17} They are necessary but not sufficient attributes of a justifiable patent regime. They strategically sacrifice detail and bite to achieve a minimalist consensus.\textsuperscript{18}

1. THE REWARD PRINCIPLE

The reward principle limits the size of the reward that the patentee can reap: the patentee’s reward may derive only from the marginal increase in social welfare that is attributable to the existence in the world of technology that the patentee actually invented. Patents hold out the possibility of a financial reward as a carrot to lure potential inventors into inventive pursuits,\textsuperscript{19} but the objective of patent law is not simply to compensate all those who engage in inventive activity. The

\begin{itemize}
\item[17.] This Article does not consider ex post efficiency justifications of patent law. See, e.g., Edmund W. Kitch, \textit{The Nature and Function of the Patent System}, 20 J.L. LAW & ECON. 265 (1977) (elaborating a prospect theory of patent law); Mark A. Lemley, \textit{Ex Ante versus Ex Post Justifications for Intellectual Property}, 71 U. CHI. L. REV. 129 (2004) (differentiating ex ante from ex post justifications). If an ex post prospect-theory justification is taken seriously, there are situations in which patent protection should violate the baseline and reward principles. For example, assume that chemical A exists in the prior art without a significant known use; that an inventor patents a single new use for chemical A; and that the principal importance of the patent is as a signal that there are many further, inventive uses for chemical A that have yet to be discovered. Prospect theory suggests that the inventor can make a reasonable argument that society is better off if the inventor has an exclusive right to the prior-art chemical A.
\item[18.] A more restrictive, controversial position is not required to illustrate the error of equating strict liability with absolute liability
\item[19.] The incentive-to-invent justification of patent law presumes that, absent a patent regime, self-interested actors inefficiently underinvest in the generation of inventive information. Inventive information is a public good: it is nonrival (the marginal cost of providing it to another consumer is zero, or at least close thereto) and nonexclusive (others cannot be excluded from consuming it). ROBERT S. PINDEYCK & DANIEL L. RUBINFELD, MICROECONOMICS 673 (4th ed. 1998). The potential inventor knows that potential competitors will learn about any inventive information generated from goods that embody it. (If the goods produced are noninforming in that they do not teach the public the inventive information, then patent apologists must rely on an incentive-to-disclose justification.) Absent a patent regime, the potential inventor expects competitors to drive goods embodying the inventive information down to their marginal cost of production. Anticipating this inability to recoup the sunk costs of invention, the potential inventor chooses not to invest in becoming an actual inventor. With patent protection, inventive information remains a nonrival good but it becomes a partially exclusive good. Potential inventors expect to internalize some of the value that the public derives from their inventive information, so their self-interest may be furthered by becoming actual inventors and investing labor and capital in the generation of inventive information.
\end{itemize}
patent regime is a meritocracy: only successful inventors receive a reward. Furthermore, it is the market that measures the existence and extent of success: rewards are measured by reductions in marginal costs of production and increases in consumers’ willingness to pay. The costs that even successful inventors (at least successful in the sense that they receive patents and exercise some monopoly power) sink into inventive activities may not be fully recouped if the invention’s supply-side efficiencies are too small or consumers’ willingness to pay for the invention is insufficiently strong. To allow the market to measure success, it is critical that a market for technology that the patentee did not actually invent never drives a patentee’s reward.

Both efficiency- and fairness-oriented worldviews provide normative justifications of the reward principle as a limit beyond which a patentee’s profit should not extend. The efficiency ramifications of the reward principle are twofold. First, the reward principle helps in a rough fashion to limit patent protection to what is needed to provide an efficient incentive to invent. Too much patent protection has the same potential to be harmful that too little does. Second, the reward principle permits patent rights to provide feedback to inventors about consumer desires. If a patentee’s reward is not proportional to consumers’ willingness to pay, then inventors and investors do not receive the proper signals, and their self-interest does not lead them to


22. The reward principle only stakes out an outer limit: the patentee’s reward should never derive from technology that the inventor did not actually invent. It does not entitle the patentee to the full social value of the inventive information generated. See infra notes 39–42 and accompanying text (emphasizing the role of welfare spillovers from invention in patent law).


the areas of research that produce the greatest welfare benefits (as measured by a willingness to pay, of course).\textsuperscript{25}

The reward principle also furthers a basic fairness concern. John Locke famously postulated that a person can generate a moral claim to property in the state of nature by mixing his labor with the raw materials of the commons.\textsuperscript{26} Simply described, if John clears a field in the plenteous woods and cultivates a crop of wheat, both the land and the wheat become John’s property because John has property in his body that, through labor, extends to the valuable goods that he produces. This story of the body has been recast as a story of the mind to produce a labor theory of patents: John has property in his mental faculties, so he has property in the inventive ideas that he reaps from the vaguely Platonic and inexhaustibly productive “field of ideas” after he has labored with his mental faculties to cultivate that “field.”\textsuperscript{27}

Scholars have repeatedly challenged the normative strength of a labor-theory justification that is sufficiently robust to support either contemporary patent law or any doctrinal variant of patent law at all,\textsuperscript{28} and the purpose of this brief discussion is not to defend a labor-theory justification of patent rights. The purpose is more humbly to reinforce the importance of the reward principle as a limit on patent protection. Assuming that a labor theory of property has some normative force when applied to patent law, it clearly cannot sanction a patent regime that grants an inventor control over technology that the inventor in no way can be said to have invented.

\textsuperscript{25} Inventors do not need to internalize all of the benefit created by their inventions. The argument here is only an intrapatent argument. To foster the efficient distribution of research funds (and assuming a uniform need for incentives), inventors’ proportionate shares of the social value of inventive information should be roughly equal in all technological fields.


\textsuperscript{27} Justin Hughes, The Philosophy of Intellectual Property, 77 Geo. L.J. 287, 315 (1988). For an overview of the wide variety of conclusions that scholars reach based on a Lockean justification of intellectual property, see Fisher, supra note 24, at 184–89.

2. THE BASELINE PRINCIPLE

The baseline principle establishes a set of privileges that a justifiable patent regime cannot take away from the public (including an inventor’s competitors): the public’s privileges should not be made smaller by a patent than they would have been if the patented invention had never been discovered. The baseline principle is part of the flip side of the reward principle. Where the reward principle limits the rights of a patentee, the baseline principle reserves a minimum set of privileges for the public.

Because the relevant baseline requires counterfactual reasoning—what would the world be like if the patented invention had never been discovered?—the rhetoric of “possible worlds” offers a concise way to discuss the baseline principle. The baseline invokes a possible world that is as close as possible to the actual world in all respects, except that the inventive technology does not exist. This Article refers to the

29. The baseline principle is only part of the flip side of the reward principle. It does not prohibit the patentee from obtaining a right to exclude from all after-arising improvements on the patented technology whose presence in the world is impossible without the inventive information discovered by the patentee. In contrast, the reward principle should limit a patentee’s reach into such after-arising improvements. The line between the after-arising improvements that an inventor did and did not actually invent is a difficult line to draw, but it is not relevant to this Article’s use of the reward principle.

30. See David Lewis, On the Plurality of Worlds 20–27 (1986) (exploring the rhetorical use of possible worlds in counterfactual thinking). The existence and nature of possible worlds is a subject of considerable debate in philosophical and linguistic circles. This Article only adopts the rhetoric of possible worlds as a way to talk about counterfactual reasoning; its arguments do not take a side in the philosophical debate.

31. The “actual world” is a term of art in possible-world discourse. In a “realist” understanding of possible worlds, the actual world is merely one of the many possible worlds and is just one that “is special, closer to our hearts and distinguished somehow from the others that are ‘merely’ possible.” John Divers, Possible Worlds 5 (2002) (structuring possible-world discourse around a debate between realist and antirealist camps). “Close,” too, is a possible-world term of art. See Lewis, supra note 30, at 21. As soon as one creates a possible world by making a single change to the actual world, one opens a Pandora’s Box of other possible changes. See, e.g., id. (noting that in a possible world defined by the premise that “kangaroos have no tails” it is possible to assume as well that “kangaroos float around like balloons”). Even if “gratuitous departure[s] from the background of fact” in the actual world are prohibited, the possible-world construct defined by a single, counterfactual shift from the actual world is better understood as “an ill-defined class” of possible worlds rather than a single possible world. See, e.g., id. (noting that in a possible world in which “kangaroos have no tails” there is “no telling whether the kangaroos have stumps where the tails should be”). The notion of the possible world that is closest to the actual world follows from the choice of the single possible world from the ill-defined set that is the most reasonable from the perspective of the actual world. See id. In sum,
baseline possible world as Possible World 1 ("PW1") and the contents of PW1 as "PW1 technologies." The baseline principle holds that the public’s privileges in the actual world with a patented technology cannot be diminished with respect to the privileges that the public possesses in PW1. In other words, patents cannot restrict access to PW1 technologies.

PW1 contains two groups of technology. PW1 contains the technologies that are prior art with respect to the patented invention—those technologies that were in existence before the discovery of the patentable invention. Because patent law relies on the prior art in its day-to-day operation, the identification of the prior art is unlikely to create many administrative problems for the generation of PW1. However, PW1 contains more than prior-art technology. Because it is defined on a particular historical date, the prior art is static. In contrast, the contents of PW1 grow during the term of a patent. Although PW1 lacks the patented invention and its improvements, technological progress in PW1 does not come grinding to a halt. PW1 still contains all technologies that are unrelated to the patented technology and discovered despite the absence of the patented technology. Much more so than the definition of the prior art, the definition of this category of post-invention-yet-unrelated technologies is open to a host of controversies at the margin. Thankfully, however, these controversies

32. The prior art consists of technologies that were actually in existence prior to the date of the invention, 35 U.S.C. § 102(a), (e), (g) (2000) (novelty), and technologies that were only constructively in existence, id. § 103 (nonobviousness). For the sake of simplicity, this Article equates the prior art with the technology that existed prior to the discovery of a patentable invention and disregards the prior art created by the statutory bars. See id. § 102(b), (d) (describing statutory bars that generate prior art with respect to dates of filing rather than dates of invention).

33. Many constructive-nonvolition cases can be resolved by assuming that only the prior art is in PW1, but some cases require that PW1 incorporate postinvention technology. See, e.g., infra notes 64, 157 (discussing how PW1 art that is not the prior art is important in constructive-nonvolition analysis).

34. The question required to define this category with precision is a counterfactual of immense complexity: over the term of a patent, how does the set of technologies extant in PW1 diverge from the set extant in the actual world? For example, if the discovery of technology A highlighted the consumer demand for competing technologies B and C, but did not provide any technological advance required to produce them, are B and C present in the PW1 defined by the absence of A? Cf. infra note 205 and accompanying text (discussing the difficulty in Laboratory Corp. of determining whether the vascular-heath correlation exists in PW1 defined by the absence of the vitamin B12 correlation).
do not need to be addressed in most cases. What is important is that PW1 contains both the prior art and at least a set of intuitively identifiable postinvention technologies that are clearly unrelated to the subject matter of the patent. For example, if someone invents a glass-sided toaster so consumers can tell how brown their toast is before it pops out of the toaster, both prior-art toasters and other postinvention technologies clearly unrelated to the glass-sided toaster, such as wrist-TVs, software, and isolated and purified genes, are PW1 technologies.

Not surprisingly, the normative justifications of the baseline principle mirror those discussed in reference to the reward principle. If a patentee controls PW1 technology, the public inefficiently underutilizes it from a short-run, static-efficiency perspective (if they get to use it at all), yet the existence of a long-run, dynamic-efficiency gain is highly questionable. From a fairness perspective, a patent should not take something away from the public that an inventor cannot make a colorable claim to have produced through labor. Patent rights that violate the baseline principle are a form of unfair compulsion or bullying of the public.

3. THE PRINCIPLES’ LIMITATIONS

The reward and baseline principles are modest propositions. They have limited bite. They are satisfied by a broad array of patent regimes. Because it is critical to understand what these principles are not in order to understand what they are, this subsection highlights three limitations that mitigate the practical impact of these principles.

First, the reward principle does not prevent inefficient overprotection of inventive information. It is entirely possible that all patent regimes are inefficient, so restrictions on the nature of patent

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35. See supra text accompanying notes 23–27 (outlining the normative justifications of the reward principle).

36. A patent system that does not respect the baseline principle raises antitrust concerns. The baseline-principle presumption that a patent does not harm buyers in markets for goods available prior to the discovery of the patented invention plays a large role in defusing the potential conflict between a patentee’s exclusive rights and antitrust law. 10 PHILLIP E. AREEDA, HERBERT HOVENKAMP & EINER ELHAUGE, ANTITRUST LAW: AN ANALYSIS OF ANTITRUST PRINCIPLES AND THEIR APPLICATION ¶ 1780a (2d ed. 2004). But see id. at 454 n.7 (noting that a patentable improvement invention may affect the price of PWI technologies in the actual world because it may reduce demand for a prior art good to a point that is below a minimum efficient scale of production).

protection categorically cannot guarantee efficiency.\textsuperscript{38} Furthermore, it is widely believed that an inventor should not be able to internalize the entire welfare benefit attributable to the invention’s presence in the world.\textsuperscript{39} The patent regime has positive externalities and spillovers vis-à-vis the inventor built into its very core.\textsuperscript{40} Efficient rewards should be a proportionate fraction of, not equal to, the welfare benefit attributable to the technology actually invented by the inventor.\textsuperscript{41} The reward principle merely marks an outer extremity of patent protection that should under no circumstances be surpassed.\textsuperscript{42}

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38. The public is worse off in the actual world with a patented technology priced above its marginal cost of production than it is in a possible world with the same technology without patent protection. The extent to which this fact forms the basis of a convincing indictment of the patent regime, however, depends on the extent to which the technological contents of the actual world would still exist if patent protection were eliminated.


41. Rewards that are smaller than the full quantum of the welfare benefit produced by the existence of an invention in the world can also be justified on fairness grounds. See Gordon, \textit{supra} note 37, at 478–79 (noting that rights of recovery should be limited to what is necessary to recoup the value added).

42. The fact that patents should not violate the reward principle does not mean that inventors are never overrewarded under the contemporary patent regime. Owners of patents on components of a larger product may be overrewarded because of the bargaining power that they achieve through holdup and systematic error in the calculation of reasonable royalties. See Mark A. Lemley & Carl Shapiro, \textit{Patent Holdup and Royalty Stacking}, 85 Tex. L. Rev. 1991 (2007). Mistakenly issued patents that read on the prior art violate the reward principle (as well as the baseline principle). See Shapiro, \textit{supra} note 39, at 29–33 (arguing that an enhanced patent reexamination procedure would bring patent rewards into closer alignment with inventors’ contributions).
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Second, the baseline principle disregards the cost of administering the patent regime. Some patents erroneously encompass obvious inventions, granting patentees claims that literally read on what should be PW1 technologies in a perfectly administered patent regime. Even if these error costs are assumed away and only inventive technologies are patented, the practitioners of PW1 technology incur search costs in the actual world that do not incur in PW1. Because the boundaries of patent rights are often fuzzy, some practitioners of PW1 technology endure the costs of litigation in the actual world. Furthermore, because patent searches are not only fuzzy, but also costly, some defendants who think they are practicing PW1 technology infringe patents. These innocent infringers use a technology that, to their surprise, is patented. They are willing to pay the competitive price for the technology, but they wind up paying damages as well and thus more than they were willing to pay. The cost of search and the uncertainty of fuzzy boundaries make some practitioners of PW1 technology worse off in the actual world than they are in PW1.

Third, neither the reward nor the baseline principle restricts how patent protection deals with independent or nearly simultaneous invention. Under contemporary patent doctrine, independent inventors are infringers, and independent invention of a patented technology is not a valid defense to infringement. The absence of an independent-invention defense does not violate either the reward or the baseline principles because PW1 is defined here not only as a possible world in which the inventor fails to discover the patented technology but also as a possible world in which nobody discovers the patented technology. Although it is reasonable to argue that patent doctrine should give special dispensation to independent inventors on both efficiency and fairness grounds, such dispensation is not required to satisfy the

44. See 35 U.S.C. § 284 (2000) (linking monetary remedies to a reasonable royalty or the patentee's lost profits).
45. Cf. supra note 5 (discussing innocent infringement).
46. See, e.g., Gordon, supra note 37, at 450 n.2 (noting that the fairness argument supporting intellectual property is undermined in patent law because independent invention is not a defense to infringement); Stephen M. Maurer & Suzanne Scotchmer, The Independent Invention Defense in Intellectual Property, 69 ECONOMICA 535 (2002) (arguing that an independent-invention defense maintains sufficient incentives to invent while reducing dead-weight loss); Shapiro, supra note 39, at 19–29; Samson Vermont, Independent Invention as a Defense to Patent Infringement, 105 MICH. L. REV. 475 (2006).
minimalist, consensus position staked out by the reward and baseline principles.

B. Constructive Nonvolition

Defendants in patent infringement suits commonly argue in substance that they should prevail because the patentee's rights do not satisfy the reward and/or baseline principles. Yet, defendants do not use these terms. They couch their arguments in a variety of specific doctrines, most all of which point to the same conclusion: the scope of a claim is too broad because it allows a patentee to control PW1 technology. The argument may sound in claim construction: the meaning of a claim's terms should be interpreted so that the claim describes only the technology that the inventor has "actually invented" and nothing more. It may sound in novelty or nonobviousness: a claim cannot encompass prior art technologies that the inventor did not invent, either literally or through the doctrine of equivalents. It may sound in enablement or written description: a valid claim cannot describe technologies unrelated to those disclosed in the patent.

In most instances, these scope-limiting tools are the only tools that courts need to enforce the reward and baseline principles. Cases involving defendants who qualify for the constructive-nonvolition exemption, however, are the exception to this rule. Constructive nonvolition does not involve claims that are overbroad on their face. It involves an unjustifiable restraint on the public's ability to avoid the use or benefit of a claimed technology. A defendant uses a patented technology in a constructively nonvolitional manner whenever the defendant must give up a valued privilege to use an unpatented PW1

47. The control may result from a literal claim that is too expansive, see Motion Picture Patents Co. v. Universal Film Mfg. Co., 243 U.S. 502, 510 (1917) (describing the literal scope of a claim as the "metes and bounds" of an inventor's property interest), or from an overly liberal application of the doctrine of equivalents that expands a patentee's rights beyond literal claim scope, Warner-Jenkinson Co. v. Hilton Davis Chem. Co., 520 U.S. 17, 25-28 (1997) (reaffirming the vitality of the doctrine of equivalents).


49. See supra note 32 (discussing novelty and nonobviousness).


technology in order to avoid or reduce the benefit obtained from the patented technology.

Both defendants who use a patented technology through a deliberate act and those who do so through an involuntary act can avail themselves of a constructive-nonvolition defense. Although the definition of constructive nonvolition is the same in both types of cases, each is introduced independently.

1. DELIBERATE-ACT CASES

The concept of constructive nonvolition in a deliberate-act case is best introduced through an example, and the unusual facts pleaded by the plaintiff in SmithKline Beecham Corp. v. Apotex Corp. provide an excellent one. In the 1970s, SmithKline Beecham ("SmithKline") invented and patented a specific form of crystalline paroxetine hydrochloride ("PHC"), which for simplicity can be labeled Form One. In the mid- to late-1980s, SmithKline invented and patented a new and more stable form of PHC—Form Two. SmithKline received FDA approval to market PHC as an antidepressant drug under the name Paxil. When Apotex applied to the Food and Drug Administration to market a generic version of Form One PHC after the expiration of the Form One patent but before the expiration of the Form Two patent, SmithKline sued.

SmithKline argued that Apotex's generic pill infringed its Form Two patent because any attempt to manufacture Form One would necessarily produce trace amounts of Form Two. This factual allegation placed SmithKline Beecham in an awkward but not impossible position. SmithKline had to insist that Apotex's Form One pill would necessarily be contaminated with Form Two to demonstrate use of a substance within the scope of the Form Two claim, but it also had to contend that pure and uncontaminated Form One was all that was produced prior to the invention of Form Two to ensure the validity of its Form Two claim. To thread this needle, SmithKline offered expert testimony on "polymorph" and "seeding" theories. Form Two is a polymorph of PHC that is difficult to produce initially but, once produced, is infectious. Crystals of Form Two that come into contact with Form One induce the less stable Form One to transform spontaneously into Form Two. SmithKline alleged that "the general environment" and

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52. 247 F. Supp. 2d 1011 (N.D. Ill. 2003) (Posner, J.) (SmithKline I), aff'd, 365 F.3d 1306 (Fed. Cir. 2004) (SmithKline II), vacated, 403 F.3d 1328 (Fed. Cir. 2005) (en banc) (SmithKline III), remanded to 403 F.3d 1331 (Fed. Cir. 2005) (SmithKline IV). The plaintiff's allegations recited in the following text are presented in SmithKline II, 365 F.3d at 1308-10.
Apotex's factories in particular had become "seeded with crystals" of Form Two, making "the creation of a pure version of the old [Form One] . . . difficult, if not impossible." 53

The courts had a difficult time addressing SmithKline's alleged facts. They repeatedly attempted to render them legally irrelevant, 54 and a panel of the Court of Appeals for the Federal Circuit in its second opinion eventually concluded that the seeding and polymorph theories were unsupported as a matter of fact by the record. 55 The concept of constructive nonvolition, however, directly and succinctly addresses SmithKline's allegations.

Constructive nonvolition puts a spotlight on the fact that SmithKline's invention of Form Two not only increases Apotex's options but also restricts them. In one sense, the invention of Form Two in the actual world gives Apotex an option that does not exist in PW1: if Apotex values the extra stability of Form Two vis-à-vis Form One, Apotex can seek a license from SmithKline to produce Form Two. However, the invention of Form Two also takes away some options that Apotex possessed in the actual world prior to the invention of Form Two and that Apotex continues to possess in PW1. To eliminate Form Two from its generic PHC drug, Apotex has two options. It can abandon the production of Form One until after the expiration of the Form Two patent, or, as the district court noted, it can build a new plant in Antarctica, far from the threat of seeding. 56 Critically, both of these options place Apotex in a worse position than Apotex occupies in PW1 where nobody invented Form Two. Apotex must retreat from its PW1 privileges in order to avoid making Form

53. SmithKline II, 365 F.3d at 1310. A patent law adage states that if an object that comes into existence after an invention has been made infringes a claim, then the object would have anticipated the claim (i.e., rendered the claim invalid for lack of novelty) if it had existed earlier, before the time at which the invention was made. See Knapp v. Morss, 150 U.S. 221, 228 (1893). SmithKline's pleadings respected the rule of law conveyed by this statement but undermined it as a matter of fact, alleging that the nature of a Form One pill was changed by the bringing of the invention into the world.

54. The district court read a variety of limitations on concentration into the Form Two claim to conclude that Apotex did not infringe despite the trace amounts of Form Two in its generic drug. SmithKline I, 247 F. Supp. 2d at 1029-30. An initial opinion of the Court of Appeals for the Federal Circuit overruled this claim construction but held the claim invalid because of a public use under 35 U.S.C. § 102(b). SmithKline II, 365 F.3d at 1316-21. Acting en banc, the Federal Circuit vacated this opinion. SmithKline III, 403 F.3d at 1329.

55. SmithKline IV, 403 F.3d at 1342-46 (concluding that Form Two had always been produced "as a natural derivative of practicing" the method described in SmithKline's Form One patent).

Two or reduce the benefit that it receives from Form Two.\textsuperscript{57} The invention of Form Two, together with its dispersal, changes the physics of the world in a manner that reduces the set of privileges that a noninfringing Apotex can enjoy in the actual world in comparison to the set of privileges that Apotex can enjoy in PW1.\textsuperscript{58} It decreases Apotex's options, rather than leaving them unaffected, if Apotex chooses not to license or practice the technology claimed by SmithKline's patent. In PW1, Apotex can manufacture Form One of PHC anywhere in the United States after the expiration of the Form One patent. In the actual world, Apotex cannot manufacture Form One outside of Antarctica.

Apotex should not be an infringer. Apotex's deliberate choice to hit the "on" button in the factory while knowing that some Form Two will exist in its pills is an example of constructive nonvolition. Although contested during the case, the novelty and nonobviousness of the Form Two claim are not the crux of the problem if SmithKline's allegations are taken seriously. Rather, the problem is the restricted nature of Apotex's options for avoiding the use of the claimed technology. If Apotex seeks to respect patent entitlements and desires not to manufacture Form Two, its choice set is impermissibly restricted.

A decision to avoid SmithKline's patented technology and not to manufacture Form Two imposes a cost on Apotex that cannot be justified under the reward and baseline principles.\textsuperscript{59} A claim-avoiding

\textsuperscript{57} In his concurrences in SmithKline II and SmithKline IV, Judge Gajarsa focuses on the difficulty of avoiding infringement. He argues that the Form Two claim is per se invalid under section 101 because it fails to give the public sufficient notice of how to avoid infringement if a "natural physical process" transforms Form One into Form Two. See SmithKline IV, 403 F.3d at 1359 (Gajarsa, J., concurring); SmithKline II, 365 F.3d at 1329 (Gajarsa, J., concurring). But see infra text accompanying notes 68-71 (arguing that SmithKline is not a section 101 case).

\textsuperscript{58} The reduction follows from an amalgam of nonlegal and legal constraints. The constraint is nonlegal in the sense that the "architecture" of the world changed. See Lawrence Lessig, The New Chicago School, 27 J. LEGAL STUD. 661, 664-65 (1998) (contrasting law and architecture as distinct modalities of regulation). Whereas performing steps A, B, and C in PWI produces Form One, performing steps A, B, and C in the actual world produces Form One with trace amounts of Form Two. Legal constraints contribute to the problem because it is patent law that takes the performance of steps A, B, and C in the actual world off the slate of options available to a noninfringer if strict liability is equated with absolute liability.

\textsuperscript{59} More precisely, the cost should be measured not by the cost of avoiding the claimed subject matter altogether but rather by the cost of further reducing the benefit obtained from the appropriation. See infra text accompanying notes 65-68. This added precision is not required to understand SmithKline because Apotex can reduce the benefit obtained from Form Two only by avoiding appropriation of the Form Two entitlement.
Apotex is legitimately expected to bear a cost as part and parcel of a well-functioning patent regime—the opportunity cost of practicing the PW1 art in the actual world rather than the patented technology. If Apotex does not reach a licensing agreement with SmithKline, it must be expected to bear the opportunity cost of making a Form One PHC pill when SmithKline can make Form Two. However, the cost to Apotex of not manufacturing Form Two impermissibly includes the cost of abandoning a privilege enjoyed and valued in PW1, namely the ability to manufacture Form One (or at least to do so elsewhere than in Antarctica). To avoid manufacturing Form Two, Apotex must retreat from its PW1 privileges in violation of the baseline principle. Because SmithKline can prevent Apotex from enjoying PW1 privileges in the actual world if strict liability is strictly construed, SmithKline's reward also violates the reward principle. If Apotex were an infringer, the licensing fee that SmithKline could obtain from Apotex reflects not only the benefit of Form Two vis-à-vis Form One (the opportunity cost of practicing the PW1 art) but also the benefit of being able to produce Form One in the United States rather than in Antarctica.

A second illustration of constructive nonvolition in a deliberate act case was explored as a hypothetical in *Monsanto Canada Inc. v. Schmeiser*, a patent infringement case recently decided by the Supreme Court of Canada.60 Schmeiser is a farmer who grows canola; Monsanto owns a patent that reads on canola seeds that are genetically modified

(“GM”) to be resistant to Monsanto’s Roundup herbicide. Schmeiser alleged that in 1997 he first discovered that Monsanto’s herbicide-resistant crops were planted on his farmland when a significant percentage of the canola in one of his fields survived after the application of Roundup. He surmised that the wind blew the seeds onto his land from a nearby farm or a passing truck. At the end of 1997, he harvested, segregated, and saved the seeds from the canola in the field that survived the application of Roundup and used them to plant new fields in 1998.

Monsanto sued Schmeiser for patent infringement. Even accepting Schmeiser’s factual allegations, the Court held him liable for patent infringement. The Court emphasized that its infringement holding did not pertain to the “innocent discovery by farmers of ‘blow-by’ patented plants on their land or in their cultivated fields.”\(^6\) The Court was unable to explain exactly why cultivation of “blow-by” plants did not constitute an infringing use when Schmeiser was strictly liable,\(^6\) but constructive nonvolition provides the answer. If GM seeds are merely blown onto a farmer’s land, the farmer can avoid appropriating the GM-seed entitlement altogether only by plowing under his fields, letting the crop rot, or presciently building a precautionary fence impermeable to wind-born seeds around his farm at an earlier point in time. Requiring a “blow-by” farmer to take such measures to avoid appropriating the GM-seed entitlement, however, forces the farmer to abandon privileges that he enjoys in PW1 and thereby violates the baseline and reward principles.\(^6\) In PW1, the farmer can grow non-GM

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61. \textit{Id.} ¶2; see also \textit{id.} ¶¶ 86, 92.

62. The Court implies that the “blow-by” farmer might not use the seeds but might merely possess them instead. \textit{Id.} ¶ 86 (suggesting that the “blow-by” canola farmer might be able to rebut the presumption of use that flows from possession). As in United States law, Canadian patent law holds that mere possession of a patented invention does not make a defendant liable and requires that a defendant use a claimed invention to trigger infringement. \textit{Id.} ¶¶ 28–58 (discussing Canadian law on use). The position that the “blow-by” canola farmer does not use the claimed invention whereas Schmeiser does, however, is questionable as a factual matter. Both farmers allow crops to grow, and both farmers harvest them. One way of reading the Court’s opinion is that it contorts the use doctrine to achieve the policy goal of effectuating part of a constructive-nonvolition exemption to patent infringement.

63. \textit{But cf. id.} ¶ 86 (suggesting that even the farmer who finds “blow-by” canola seed on his land might have an obligation to “act[] quickly to arrange for its removal”). The possibility that Monsanto might be able to force the “blow-by” farmer not to cultivate or harvest the GM seeds if it compensates the farmer for any loss incurred highlights a tension in constructive nonvolition between its efficiency- and fairness-oriented justifications. If efficiency is the guiding principle, then Monsanto should have the right to force the farmer not to cultivate and harvest so long as the farmer is made financially better off in the actual world than he is in PW1. However, if fairness is the dominant concern, then the farmer should have the right to continue the
crops and can do so without an impermeable fence. In the actual world, the noninfringing farmer is legitimately required to bear the opportunity cost of harvesting less-efficient, non-GM canola if he chooses not to license Monsanto's patented GM canola. However, the noninfringing farmer should not be forced to bear any cost above and beyond this opportunity cost. If strict liability is equated with absolute liability for the appropriation of Monsanto's patent entitlement, however, the licensing fee that Monsanto can extract from the "blow-by" farmer is much larger than the value of the technology that Monsanto actually invented.\textsuperscript{64}

The actual facts in \textit{Schmeiser} demonstrate that a further refinement of the concept of constructive nonvolition is needed. Both the Apotex and the "blow-by" farmer cases portray constructive nonvolition as a legal determination that hinges on the cost to the defendant of avoiding appropriation of the patent entitlement. The relevant question, however, should be the cost to the defendant of reducing the benefit received from appropriation. The Court found Schmeiser liable for patent infringement, yet Schmeiser and the "blow-by" farmer cannot be differentiated on the basis of the cost of avoiding appropriation of Monsanto's patent entitlement. Schmeiser incurs the same costs as the "blow-by" farmer if he chooses not to use the GM-seed technology at all. He too must under plow his field. The difference between Schmeiser and the "blow-by" farmer is that Schmeiser goes out of his way to increase the benefit that he receives from the GM seeds that blow onto his land:

[Mr. Schmeiser] in this case actively cultivated canola containing the patented invention as part of [his] business operations. Mr. Schmeiser complained that the original plants came onto his land without his intervention. However, he did not at all explain why he sprayed Roundup to isolate the Roundup Ready plants he found on his land; why he then harvested the plants and segregated the seeds, saved them, and kept them for seed; why he next planted them; and why, through this husbandry, he ended up with 1030 acres of

\textsuperscript{64} \textit{Schmeiser} illustrates why it is important to define nonvolition with respect to the opportunity cost of practicing the PW1 art rather than the opportunity cost of practicing the prior art. It makes no difference whether the canola that Schmeiser grows is prior art with respect to Monsanto's GM-seed invention. What matters is that Schmeiser's canola farming is a privilege that Monsanto cannot possibly take credit for based on its invention of the GM seed.
Roundup Ready Canola which would otherwise have cost him $15,000.65

Schmeiser, unlike the “blow-by” farmer, can reduce the benefit that he receives from appropriating the GM-seed entitlement without retreating from the PW1 baseline.66 He can avoid planting fields of Monsanto’s GM canola in 1998 without incurring a cost other than the legitimate opportunity cost of practicing the PW1 art. Holding Schmeiser liable for patent infringement violates neither the baseline nor the reward principle. In contrast, the “blow-by” farmer cannot reduce the “benefit” received from use of the patented technology without engaging in a forced retreat from his PW1 life.67

A hypothetical variation on the facts of SmithKline also illustrates the relevance to constructive nonvolition of the defendant’s ability to reduce the benefit obtained from appropriation of a patent entitlement. Xetopa, a different defendant in Apotex, manufactures PHC using a process that produces a more stable pill of almost pure Form Two that may have a longer shelf life. Xetopa cannot avoid appropriating the Form Two entitlement without abandoning a PW1 privilege, yet holding Xetopa liable as an infringer violates neither the baseline nor the reward principles. Xetopa can alter its conduct and act like Apotex without abandoning a PW1 privilege. In other words, Xetopa can reduce the benefit that it obtains from appropriating SmithKline’s Form Two entitlement, so it is not a constructively nonvolitional appropriator.68

Schmeiser and the Xetopa hypothetical illustrate that constructive nonvolition merely relieves individual defendants of liability and that it does not result in the more drastic end of invalidating a claim in its entirety. The constructive-nonvolition inquiry in deliberate-act cases

65. Id. ¶ 87; see also id. ¶ 92.
66. If Schmeiser applies Roundup to his field in PW1 in 1997, the canola dies.
67. From a patent law perspective, “blow-by” farmers are receiving a benefit, namely the use of the patented technology. Many “blow-by” farmers who sell organic or non-GM crops, however, see the arrival of GM seeds on their land as a cost. See Jane Matthews Glenn, Footloose: Civil Responsibility for GMO Gene Wandering in Canada, 43 WASHBURN L.J. 547 (2004) (surveying Canadian civil law remedies for farmers whose crops are contaminated by GM seeds).
68. Third-party conduct raises an interesting problem for constructive nonvolition. In a variation on SmithKline, assume that seeding is not easily accomplished and that it requires the release of Form Two in a special aerosol form within the production facility where Form One is made. If Apotex itself releases the aerosolized Form Two, Apotex is an infringer when it tries to produce Form One. However, what is Apotex’s status if a third party not in collusion with Apotex releases the aerosolized Form Two? Should it matter if the third party is negligent? These questions may become important in cases involving the spread of GM-seed technology.
acknowledges that “natural phenomena,” such as shifting chemical structures and self-germinating seeds, throw a wrench in the routine workings of patent doctrine.\textsuperscript{69} The traditional way for a defendant to deal with a problem caused by “natural phenomena” is to invoke section 101 of the Patent Act and argue that the claim at issue is invalid because it recites unpatentable subject matter.\textsuperscript{70} Constructive nonvolition takes a defendant-specific approach. Thanks to “natural phenomena,” a patented GM seed that has blown onto a field containing a similar crop germinates and grows. This event forces only the farmer who harvests the field to take active steps to avoid appropriating the entitlement.\textsuperscript{71} The existence of “natural phenomena” bound up with the patented technology is not a sufficient condition to render constructively nonvolitional all acts that appropriate the patent entitlement. Schmeiser purifies the “blow-by” crop after it blows into his field; other farmers intentionally plant the patented GM seed without authorization. Xetopa goes out of its way to make a patented chemical because the chemical has a longer shelf life than the prior-art chemicals. In these last examples, “natural phenomena” do not place the defendants in an impermissible bind. The defendants are infringers because they can reduce the benefit that they receive from the patented technology without abandoning options that they possess and value in PW1.

2. INVOLUNTARY-ACT CASES

Compared to the deliberate-act cases, the involuntary-act cases are the low-hanging fruit of an argument that constructive nonvolition should provide an exemption from patent liability. As an exceptional


\textsuperscript{70} Section 101 invalidates any claim that encompasses “natural phenomena” because “natural phenomena” are unpatentable subject matter. \textit{See} Diamond v. Diehr, 450 U.S. 175, 185 (1981). Interestingly, a concurrence in \textit{SmithKline}, see supra note 57, and a dissent in \textit{Schmeiser}, [2004] S.C.R. 902, ¶ 107-11 (Arbour, J., dissenting in part), both relied on arguments related to unpatentable subject matter to conclude that the defendants were not liable.

\textsuperscript{71} In contrast, a patented widget that is not self-animated by “natural phenomena” is merely possessed at best, not used, when it falls off of a truck into a farmer’s field. The constructive nonvolition implicated in the “blow-by” variant on \textit{Schmeiser} is not specific to self-replicating GM-seed technology. If a patented, long-lasting fertilizer blows onto a farmer’s fields, the “natural process” through which the fertilizer nourishes plants means that the farmer is “using” the patentee’s fertilizer entitlement for many years. The self-replicating nature of the GM-seed technology changes the stakes for the patentee, but it is not essential to the legal determination of constructive nonvolition.
rather than routine occurrence, any patent claim can give rise to an involuntary-act case. All people lose control of their actions and chattels from time to time. For example, a patentee claims a method of stretching the human body that recites tumbling steps, and an alleged infringer trips and reflexively performs the claimed method to avoid injury. A patentee claims a method of fermentation that recites the act of raising the temperature of a compound according to a particular formula over time, and an alleged infringer has a sample of the compound that is heated up in this manner because of an intermittent power outage in the freezer. A patentee claims an improved stapler. An alleged infringer passes out, falls on an unauthorized embodiment of the stapler and staples a document. Because object claims are infringed when the defendant makes, uses, or sells a claimed embodiment of the object, they too can give rise to involuntary-act cases.

As in the deliberate-act cases, holding a defendant in an involuntary-act case per se liable for appropriating a patent entitlement can violate both the reward and baseline principles. The problem in these cases is again the excessive cost that the defendants must incur in order to avoid or reduce the benefit obtained from the patented technologies. Even rational defendants cannot choose not to perform the involuntary act itself, so an injunction targeted specifically on the performance of the involuntary act is a contradiction in terms.

72. But cf. infra notes 125–29 and accompanying text (arguing that defendants’ involuntarily acts may appropriate the entitlements described by reflexive-thought-propertizing claims on a routine basis).


74. The fact that people do not engage in a conscious cost-benefit analysis prior to every choice that they make does not mean that their choices are not rational. See LANDES & POSNER, supra note 21, at 4. Nonetheless, an assumption that a choice could be made is foundational to the rational maximization of ends, and no possible choice-point exists immediately prior to an involuntary act.

75. A state-enforced right to exclude is not a straight-jacket rule. Cf. Lessig, supra note 58, at 664–65 (contrasting law and architecture as distinct modalities of regulation). The sine qua non of legal protection of an entitlement with property rule is that the state defends a private individual’s right to exclude with its authority and power. The hope, however, is that the state will not be called upon to overtly act in most instances, that the background threat of ex post, state-imposed sanctions will deter the rational personal-welfare maximizer ex ante from appropriating the entitlement without the owner’s consent, and that market exchanges of entitlements will flourish. A right to exclude from others’ involuntary conduct, however, does not promote market exchanges because involuntary conduct cannot be deterred. Depending on one’s temperament, a right to exclude from others’ involuntary conduct is either laughable or Kafkaesque. Either the entitlement will simply go unprotected or appropriators will eventually be sent to jail for contempt of court when they routinely violate an injunction against appropriation. Of course, it is possible (although likely unreasonable) to enjoin a defendant from creating the conditions that are required for the involuntary act to occur. See infra text accompanying note 76.
Appropriation of the patent entitlement, however, is rarely entirely beyond the control of the defendant even in an involuntary-act case. It is often possible for a defendant to avoid creating the conditions under which the involuntary act of appropriation can occur. The fainter can stay out of the bubble of space surrounding the patented stapler. The freezer owner can chose not to own or freeze the compound. Here, however, the cure is worse than the disease. Requiring potential defendants to avoid the conditions necessary for involuntary entitlement-appropriating acts to occur makes the patentee’s claims magnetic in a way that pulls all sorts of unclaimed conduct into the patentee’s sphere of control. A fainter who cannot approach within four feet of a stapler is far worse off than he or she is in PW1, and the price that the fainter will pay to be able to approach within four feet of a stapler is way out of proportion to the benefit of the technology actually produced by the patentee.  

The involuntary-act cases raise questions about per se liability in patent law in part because of their strong resemblance to conventional, nonvolitional-act cases in criminal law, trespass, and copyright. In criminal law, a nonvolitional act is a subcategory of the conduct that fails to satisfy the “voluntary act” requirement and is therefore unpunishable even under a strict liability law. Roughly speaking, the...

76. The difficult question that the involuntary-act, constructive-nonvolition cases raise is not whether the reward and baseline principles are violated. They clearly are. The difficult question is whether certain involuntary actors should be exempted from liability when no innocent actors are exempted. See supra text accompanying notes 43–44 (noting the innocent infringers may be worse off than they are in PW1 when the costs of administering patent rights are considered). It is reasonable, however, to exempt the former but not the latter for two reasons. First, neither more clarity in patent scope nor more thorough patent searches can resolve the problem created by constructive nonvolition. Second, the litigation costs generated by a constructive-nonvolition exemption for some involuntary actors are not as systemic as those that an exemption for innocent infringers would create. A large percentage of defendants in patent cases can raise a colorable invalidity argument and can therefore lay claim to being innocent infringers. Few defendants, however, can allege a nonfrivolous and involuntary entitlement-appropriating act.

77. The voluntary act requirement is sometimes presented as a unifying principle on which all criminal liability depends, including strict liability crimes for which there is no mens rea requirement. See, e.g., Model Penal Code § 2.01(1) (1962) (“A person is not guilty of an offense unless his liability is based on conduct which includes a voluntary act or the omission to perform an act of which he is physically capable.”); Michael S. Moore, Act and Crime: The Philosophy of Action and Its Implications for Criminal Law 17–18 (1993). Whether the voluntary act requirement is a useful concept, however, is open to debate. Can the voluntary act requirement provide a philosophical metanarrative that helps to legitimate criminal law as a field? Cf. Jean-François Lyotard, The Postmodern Condition: A Report on Knowledge xxiv (Geoff Bennington & Brian Massumi trans., 1984) (identifying the postmodern with a skeptical posture toward legitimating metanarratives). Or, is the act
voluntary act requirement prohibits punishment based solely on status, mental state, involuntary bodily movement, and omission.\textsuperscript{78} For the philosophically inclined, the act requirement distinguishes voluntary bodily movements that are punishable from involuntary ones that are not based on the presence of an antecedent mental “volition” or wish to perform the act.\textsuperscript{79} Volitional acts are the muscular contractions that a person wills, authors, or ushers into being,\textsuperscript{80} whereas nonvolitional bodily motions originate from some source other than an “individual self” and elude the individual’s control.\textsuperscript{81} Nonvolitional bodily actions include motions compelled by another (coercion), triggered by pain or physical contact (reflex), or ordered by a person’s unconscious mind (automatism).\textsuperscript{82} A disease, not an individual-as-subject, causes an epileptic seizure.\textsuperscript{83}

Trespass, too, illustrates the role of nonvolition as an exemption from liability even in a strict liability regime.\textsuperscript{84} Although innocent invasions are trespasses, nonvolitional invasions are not. If the requirement an obfuscating appellation for a loosely affiliated set of normative rules that address diverse problems? Compare Moore, supra, at 6–7 (arguing that the voluntary act is a meaningful category), with Symposium, Act and Crime, 142 U. Pa. L. Rev. 1443 (1994) (critiquing Moore’s position).

78. Moore, supra note 77, at 6–7. A combination of retributivist and utilitarian reasoning supports the decision not to punish defendants for nonvolitional acts. Individuals should not be held morally responsible for conduct that they did not author in any meaningful way, Kevin W. Saunders, Voluntary Acts and the Criminal Law: Justifying Culpability Based on the Existence of Volition, 49 U. Pitt. L. Rev. 443, 467 (1988), and legal sanctions cannot readily deter conduct that is beyond an individual’s control, 1 WAYNE R. LAFAVE, SUBSTANTIVE CRIMINAL LAW § 6.13.2(c), at 425–26 (2d ed. 2003).


80. Id.

81. See Saunders, supra note 78, at 467.

82. Hart, supra note 3, at 95–96. A nonvolitional act, narrowly framed, does not always let a criminal defendant off the hook. If a driver who knows that he or she is prone to epileptic seizures chooses to drive, has a seizure, and kills a pedestrian, the driver’s earlier volitional act of getting behind the wheel can become the willed act that gives rise to criminal liability. See id. at 110–12; People v. Decina, 138, N.E. 2d 799, 804 (N.Y. 1956). The ambiguity in the breadth of the time frame used to identify a nonvolitional act illustrates that the volitional-act requirement in criminal law is a policy-based rather than a purely factual or analytical inquiry. See Mark Kelman, Interpretive Construction in the Substantive Criminal Law, 33 Stan. L. Rev. 591 (1981) (demonstrating the importance of various frames that courts use to define criminal defendants’ acts).

83. Hart, supra note 3, at 98 (quoting Austin’s Lecture XVIII).

84. Technically, trespass to land is an intentional tort, Restatement (Second) of Torts § 158 (1965) (defining trespass to land), but the required intent exists whenever there is will or volition to move the body towards a desired result. Id. § 8A (defining intent).
immediate muscular movement that propels a human body or some other object across a boundary line has been willed by a person’s acting self, the invasion is voluntary regardless of a lack of knowledge of the boundary’s location. However, if a “friend” throws John across the line or he has an epileptic seizure that propels him across the line, he is not strictly liable for trespass regardless of the amount of actual damage inflicted. Even copyright doctrine has come to recognize an exemption from liability in an otherwise strict liability regime when the defendant produces a copy without a volitional act.

The appropriation of a patent entitlement through an involuntary act, however, is not sufficient evidence to let the appropriator off the infringement hook. The following tale of two appropriators illustrates that the involuntariness of the immediate act of appropriation should not be a condition sufficient to allow the appropriator to evade liability. Joe performs the recited method because he has a sudden and unexpected panic attack at a point in time when he by coincidence just happens to be in the vicinity of a patented stapler. Joe faints, lands on the stapler, and appropriates the stapler entitlement. Jane desires a fancy staple in the report she just finished. She stands over a patented stapler, uncorks a bottle of ether, inhales, faints, falls onto the stapler, and staples the document. Joe is a constructively nonvolitional appropriator. In order to avoid appropriating the entitlement, Joe must incur far more than the legitimate opportunity cost of practicing the PW1 art in the actual world. In contrast, Jane can avoid appropriating the stapler entitlement without abandoning valued PW1 privileges. Jane can choose not to pre-

85. See id. § 2 cmt. a (“There cannot be an act without volition.”); W. PAGE KEeton ET AL., ProSSER & KEeton ON THE LAW OF TORTS § 13, at 73–75 (5th ed. 1984) (noting that “all acts in the sense of movements of the body directed by the will are intentional” in the sense required for an actionable entry to land).

86. Copyright is a strict liability regime because a defendant who copies a copyrighted work is an infringer even if the defendant does not know the work is either copyrighted or an infringement of a copyrighted work, Lipton v. Nature Co., 71 F.3d 464, 470–72 (2d Cir. 1995), and even if the defendant does not consciously know that he or she is copying anything at all, Bright Tunes Music Corp. v. Harrissongs Music, Ltd., 420 F. Supp. 177, 180–81 (S.D.N.Y. 1976). To restrict the liability of internet service providers for the copies of third-party content that their servers automatically make and display, the courts crafted a nonvolitional-conduct exemption from copyright liability. See Religious Technology Center v. Netcom On-Line Communication Services, Inc., 907 F. Supp. 1361, 1368–73 (N.D. Cal. 1995). The nonvolitional conduct exemption now encompasses situations in which the owner of an internet server actively approves the posting of specific third-party content (i.e., an employee volitionally hits an “approve” button). See CoStar Group, Inc. v. LoopNet Inc., 373 F.3d 544, 549–52 (4th Cir. 2004). The exemption no longer tracks nonvolitional conduct as a factual matter (if it ever did); its scope is determined by the normative goal of shielding a class of actors from liability for direct copyright infringement.
position herself over the patented stapler and inhale the ether. Jane’s act of infringement in a narrow time frame is equally as involuntary as Joe’s. She cannot help but fall after she loses consciousness. Nonetheless, in terms of patent liability, Jane should be treated no differently than someone who deliberately presses down on the stapler.

3. UNIFYING THE DELIBERATE- AND INVOLUNTARY-ACT CASES

In both the deliberate- and involuntary-act case types, a constructive-nonvolition exemption to strict liability is required to ensure respect for the reward and baseline principles. If the defendant cannot avoid or reduce the benefit obtained from the patented technology in the actual world without having to abandon valued PW1 technologies, then the defendant’s appropriation of the claimed entitlement should not render the defendant liable for patent infringement.

The claim construction and the invalidity doctrines that are most commonly used to prevent violations of the reward and baseline principles cannot detect the violation at issue in a constructive-nonvolition case. As Figure 1 illustrates, the literal scope of the claim involved in a constructive-nonvolition case is not overbroad in any way that a court using these doctrines is able to detect:

87. Jane, too, performs a set of actions that are part of the PW1 art. She locates herself in space and inhales ether. If she performs these actions because she values the stapling that results in the actual world and not the acts that lead up to the stapling, then Jane is an infringer. Forcing Jane to avoid appropriating the entitlement does not force her to abandon valued privileges in PW1. However, if Jane can make a good-faith argument that she values inducing unconsciousness in this manner at random locations in PW1, then she is a constructively nonvolitional appropriator. She is forced to abandon a valued PW1 privilege in order to avoid appropriation. As this example suggests, constructive nonvolition in involuntary-act cases can frequently be reduced to a question of specific intent: did the defendant specifically intend to perform the involuntary act? Cf. infra notes 164–66 and accompanying text (discussing the role that the motivation for a defendant’s willingness to pay plays in distinguishing infringers from constructively nonvolitional appropriators in cases involving reflexive-thought-propertizing claims).
In the traditional overbreadth scenario (on the left of Figure 1), there is an unjustified presence within the figure of the claim. In contrast, the crux of constructive nonvolition lies in an unjustified absence from the public privileges that comprise the ground surrounding that figure (on the right of Figure 1), an absence that is traceable to an involuntary action or a self-perpetuating “phenomenon of nature.” Both an oversized figure and an undersized ground produce the same result: a violation of the reward and baseline principles.

The goal of a constructive-nonvolition exemption from liability for patent infringement is to identify defendants that the law should treat as physiologically nonvolitional actors. The goal is not to identify those actors whose narrowly framed acts of appropriation are nonvolitional and thus entirely beyond their control as a factual matter. It is in this sense that the proposed doctrine is constructive nonvolition and not factual nonvolition.

The involuntariness of the immediate act of appropriation in the involuntary-act cases serves more or less the same role in those cases that the inevitableness of the “phenomenon of nature” serves in the deliberate-act cases. Both raise red flags indicating that the defendant’s nonappropriating or benefit-reducing choices may be constrained. 88 However, as Figure 2 illustrates, neither an involuntary immediate act of appropriation nor the presence of a self-perpetuating “natural phenomenon” is sufficient to prove constructive nonvolition:

88. The red flag arguably flies higher in an involuntary-act case. Therefore, perhaps an involuntary, entitlement-appropriating act should produce a presumption that, if unrebutted, a constructive-nonvolition exemption from liability is merited and a deliberate-act case should involve the opposite presumption.
In both case types, the definition of constructive nonvolition is identical: constructive nonvolition arises when a defendant, who structures his or her activities so as to minimize any invasion into the patentee's inventive terrain, cannot enjoy in the actual world the privileges that he or she values in PW1. Constructive nonvolition exists when a defendant's choice set is impermissibly constrained: the defendant must either give up a valued right to practice a PW1 technology or appropriate the entitlement described by the patentee's claim. Inversely, constructive nonvolition allows a defendant to practice a patented technology when the choice not to practice the patented technology provides an interesting, if imperfect, parallel to constructive nonvolition in patent law. Both doctrines allow landowner A to obtain an easement to use the land of neighboring landowner B when a common owner previously held the parcels of A and B, and A's use of B's land is necessary to A's enjoyment of A's own land. An easement by implication arises when A's use was apparent at the time of severance. An easement by necessity can arise even if A did not use B's land at the time of severance. See Stewart E. Sterk, Neighbors in American Land Law, 87 Colum. L. Rev. 55, 60 (1986). In a constructive-nonvolition defense, the defendant (or the public more broadly) stands in the shoes of A claiming a right to practice a PW1 technology, and the patentee plays the role of B. B cannot deny A access to PW1 technologies when B files for a patent and carves off a bit of inventive terrain as private property from what had (potentially) been available for all. If it is necessary for A to use B's property in order to enjoy A's own rights to practice a PW1 technology, then A should have an easement to use B's property.
technology imposes a cost greater than the legitimate opportunity cost of practicing the PW1 art and the choice not to appropriate the patent entitlement necessarily entails a choice to abandon the use of a valued PW1 technology.

III. PATENTING REFLEXIVE ACTS OF THINKING

This Part describes the propertization of reflexive thought. The first Section defines the propertization of thought90 and introduces Claim 13 of United States Patent 4,940,65891 ("the '658 patent"), the claim at issue in Laboratory Corp. of America Holdings v. Metabolite Laboratories, Inc.,92 as an example of a thought-propertizing claim. The second Section distinguishes purposive and reflexive acts of thinking. The third Section argues that the need for a constructive nonvolition exemption will be especially acute when a patentee alleges infringement of a reflexive-thought-propertizing claim because defendants' involuntary acts will routinely appropriate the patent entitlement. The final Section distinguishes two types of reflexive-thought-propertizing claims—claims to freestanding, reflexive acts of thinking and claims to irrevocable bundles—and suggests that each type merits a distinct analysis.

A. Propertizing Thought

Patent law enforces two distinct and opposed entitlements. It grants a patentee a right to exclude from an invention's claimed embodiments. The public cannot perform the "attaching" and "welding" actions of a claimed method of making a widget without the patentee's authorization.93 Simultaneously, however, patent law mandates the creation of a commons or a public domain. Patent law's disclosure requirements grant the public a legal privilege to think about the idea that animates the patented attaching-welding invention and communicate the idea to others. The quid pro quo of patent law requires an inventor to disclose information about the invention to the public, information that the inventor could have attempted to guard behind a veil of

90. This Section summarizes arguments presented at greater length in Collins, supra note 2, at Part I.
secrecy. Once disclosed, this inventive information passes beyond the control of the inventor. It becomes freely available to the public so long as it remains in the form of information qua information.

Historically, these two opposing entitlements coexisted peacefully, side by side, at the heart of patent law because each governed a different resource. The intuitive line that divides goods that exist in the spatial world of extension from information goods that reside primarily in the realm of information and ideas marked the boundary between the realms in which each applied. People readily differentiate the propertizable, real-world actions implicated in the process of making widgets from the unpropertizable information qua information about widget making, so the dividing line between the regimes persisted, largely unquestioned and never precisely delineated. The mental steps doctrine and the printed matter doctrine are the closest the PTO and the courts have come to drawing a line to identify the information qua information that had to remain in the public domain.

A patentee who seeks to claim, and thus propertize, the mere act of thinking about information offered to the public in the patent's disclosure threatens this informal détente between the public's right to use inventive information and the patentee's right to exclude from the claimed embodiments. For example, consider the claim at issue in Laboratory Corp., a case in which the Supreme Court granted certiorari and then dismissed as improvidently granted after oral argument. Three academic researchers discovered, among other things, a statistical generalization about the chemical contents of human blood.


95. Cf. 3 DONALD S. CHISUM, CHISUM ON PATENTS § 7.01 (2007) ("[On [publication] the patent immediately increases the storehouse of public information available for further research and innovation . . . .").

96. See 1 CHISUM, supra note 95, § 1.03[6]; Collins, supra note 2, at Part III.C.1. The scope of the mental steps doctrine was notoriously ill defined, and it was never adequately justified. Cf. In re Abrams, 188 F.2d 165, 168 (C.C.P.A. 1951) ("It is self-evident that thought is not patentable."). The core of the mental steps doctrine was recently revived by the Federal Circuit in In re Comiskey, No. 2006-1286, 2007 WL 2728361, at *10 (Fed. Cir. Sept. 20, 2007) (invalidating a broad claim reciting a business method that can be performed without a machine under the mental steps doctrine). Whether the Federal Circuit or the Supreme Court will extend Comiskey to invalidate all claims that propertize thought is unclear.

97. 126 S. Ct. 2921 (2006) (dismissing the writ of certiorari as improvidently granted). For a more complete presentation of the Laboratory Corp. proceedings, see infra Part IV.D.1.
More specifically, they discovered the "vitamin B12 correlation": a level of one chemical (the amino acid homocysteine) corresponds to a deficiency of a second chemical (vitamin B12). 98 The researchers received two types of claims in the '658 patent to protect their work. Claim 1 described a new method of "assaying," or testing, the concentration of homocysteine in a patient's blood. 99 This claim was relatively uncontroversial and was never asserted in Laboratory Corp. In contrast, Claim 13 recited a two-step method of using a homocysteine test to diagnose the existence, or nonexistence, of a vitamin B12 deficiency: (1) "assaying" a patient's homocysteine level; and (2) "correlating" a low or high level of homocysteine with the presence or absence, respectively, of a vitamin B12 deficiency. 100 Under the standard rules of patent infringement, a doctor infringes Claim 13 whenever he or she performs or causes to be performed both of these steps. 101

Claim 13 propertizes thought: it recites a human act of thinking that is necessary to make the claimed method useful, novel, or nonobvious. 102 Three facts are required to explain why Claim 13 propertizes thought. First, the researchers did not invent the homocysteine test. Technologies for testing homocysteine were known prior to the researchers' work, 103 and elevated homocysteine levels were already useful for a variety of purposes, including diagnosing a rare genetic disorder 104 and assessing a patient's risk of having a heart

98. Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354, 1361–62 (Fed. Cir. 2004). Technically, the researchers discovered a correlation between "total homocysteine"—a measurement of homocysteine in four different complexed forms—and either of two specific B vitamins: cobalamin (vitamin B12) and folate. Because this Article does not question the novelty or nonobviousness of the correlation, the precise nature of the correlation is not important. It opts for ease of communication over scientific precision and simply refers to a correlation between homocysteine and vitamin B12.


100. Id. col.41 ll.58–65. This Article refers to the process of diagnosing the existence vel non of a vitamin B12 deficiency as simply the diagnosis of a vitamin B12 deficiency.

101. See Canton Bio-Med., Inc. v. Integrated Liner Techs., 216 F.3d 1367, 1370 (Fed. Cir. 2000) (finding direct infringement of a method claim if and only if "each of the claimed steps of a patented process [is] performed").

102. See Collins, supra note 2, at Part I.C (defining the propertization of thought).


104. Brief for Appellees at 43 & n.12, Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354 (Fed. Cir. 2004) (No. 03-1120). This Article refers to the knowledge used to perform this diagnosis as the "genetic-disease correlation."
attack or developing a vascular disease.\textsuperscript{105} Second, the testing step recited in the claim encompasses any technique of testing for homocysteine, regardless of whether a person uses a technique that was known prior to the researchers' work, developed by the researchers themselves, or discovered only after the researchers filed their patent application.\textsuperscript{106} Together, these first two facts demonstrate that the data-gathering "assaying" step is neither novel nor patentable on its own and that the inventiveness of Claim 13 resides entirely in the second "correlating" step. Third, the "correlating" step describes a human act of thinking. It recites an applied act of human reasoning that a doctor can employ to verify the truthfulness of a conclusion about an individual patient's vitamin B12 deficiency.\textsuperscript{107} After receiving the homocysteine test, a doctor presumptively has two pieces of knowledge. The doctor knows from the test that an individual does or does not have an elevated homocysteine level. The doctor also knows the statistical generalization discovered by the researchers, given that it was published in the patent\textsuperscript{108} and the general medical literature. Once in possession of these two pieces of information, the doctor can perform the act of "correlating": the doctor can verify the truthfulness of the conclusion that the patient does (or does not) have a vitamin B12 deficiency.

\textsuperscript{105} Brief for Petitioner at 2-3, Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 126 S. Ct. 2921 (2006) (No. 04-607); Corrected Brief for Appellant at 13, 31-32, Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354 (Fed. Cir. 2004) (No. 03-1120); Brief for Appellees at 12, Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354 (Fed. Cir. 2004) (No. 03-1120). However, widespread clinical acceptance of the practice of using elevated homocysteine levels as a predictor of vascular disease did not develop until the 1990s, after the issuance of the '658 patent. Lab. Corp., 126 S. Ct. at 2923 (Breyer, J., dissenting); Corrected Brief for Appellant at 13-14, 31-32, Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354 (Fed. Cir. 2004) (No. 03-1120). This Article refers to the knowledge used to perform this diagnosis as the "vascular-disease correlation." For other alleged uses for homocysteine tests, see Corrected Brief for Appellant at 32-33, Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354 (Fed. Cir. 2004) (No. 03-1120).

\textsuperscript{106} Lab. Corp., 126 S. Ct. at 2924 (Breyer, J., dissenting) (noting that the parties agree on this construction of "assaying"). The defendant in Laboratory Corp. used a method of testing for homocysteine that was wholly different from and invented after the method recited in Claim 1 of the '658 patent. Metabolite Labs., 370 F.3d at 1359.

\textsuperscript{107} See Collins, supra note 2, at Part I.D.2 (describing the logical structure of the "correlating" step of Claim 13).

\textsuperscript{108} Because a person who does not know about the correlation will not perform the claimed method, patent searches that uncover reflexive-thought-propertying claims do not allow defendants to avoid infringement. They perversely cause infringement.
B. Purposive and Reflexive Acts of Thinking

The acts of thinking that can fall within the scope of a patent claim span a spectrum from purposive to reflexive. This Section explores that spectrum.

People perform some mental tasks only after having deliberately decided to undertake them. If presented with six numbers between 101 and 999 and instructed to multiply them, many people can perform the assigned task in their minds if they are given sufficient time. Importantly, however, most can choose to quit without having reached an answer. The mental task is therefore a purposive act of reasoning. The acting self sets the self’s mental faculties to the task. For most people, the occurrence of the act of reasoning is not beyond willful control.

Many of the historical mental-steps cases involved claims to purposive acts of thinking. The claims at issue recited complex mathematical operations and had value primarily insofar as they read on computer software, but they were sometimes broad enough to read on human thought as well. The Supreme Court’s first attempt at resolving the patentability of computer software involved precisely such a claim. In *Gottschalk v. Benson*, the Court addressed the patentability of a “method for converting binary coded decimal number representations into binary number representations.” One of the Benson claims was arguably broad enough to encompass mental performance of the method, but the lengthy series of discrete acts recited in the claim could in all likelihood be performed mentally only after a deliberate choice to set one’s mind to the task and only with prolonged and focused concentration.

In contrast, other acts of thinking just seem to happen. When people say that their minds jump to a logical conclusion, they do not understand the process to involve one part of their minds—the part in which volition is determined—instructing another part to jump or engage in the logical operation. These acts of thinking are involuntary or reflexive. For example, if Joe tells Jane (1) that he parked his
convertible outside with the top down and (2) that it is raining, Jane does not need to consciously decide to work through a syllogistic reasoning process with unstated intermediate premises (e.g., "things exposed to the sky get wet if it is raining" and "most things parked outside are exposed to the sky") to realize that the interior of Joe’s car is probably getting wet. Jane reaches the conclusion automatically.

A doctor who performs the correlating step of Claim 13 of the ’658 patent thinks reflexively. If a doctor is exposed to the premises of the claimed act of reasoning, the doctor’s mind automatically jumps to the diagnosis. A doctor who has read about the inventor’s discovery and who looks at the results of a patient’s homocysteine test instantly reaches a conclusion about whether or not the patient has a vitamin B12 deficiency. Claim 13 is a reflexive-thought-propertizing claim.

The intuition that some acts of thinking are reflexive and not preceded by volition to think is reinforced by the “dual-process theory” in cognitive psychology.113 The dual-process model distinguishes between two systems of human reasoning that coexist in the human mind and that perform differently in terms of speed and controllability.114 System 1 reasoning is “quick,” “intuitive,” and “effortless”;115 it is “implicit,” “unconscious,” and “automatic.”116 In contrast, System 2 reasoning is “slow,” “effortful,” “deliberate,” and “rule”-oriented;117 it is “explicit,” “conscious,” and “controllable.”118 In sum, “[t]he assumption is that System 2 thinking is . . . volitional . . . whereas System 1 thinking is not.”119 The dual process theory reinforces the notion that some System 1 thinking is “rapid, parallel and


118. Evans, Reasoning, supra note 113, at 989.

119. Evans, Two Minds, supra note 113, at 456.
automatic in nature \(^{120}\) and thus beyond the control of the thinker, just like the examples of appropriation in the involuntary-act cases that involve bodily motion.\(^ {121}\)

The dual process theory also offers some insight into what types of thinking are likely to be performed reflexively. Among its other characteristics, System 1 thinking is commonly implicated "when we make practical decisions that help us to achieve our personal goals."\(^ {122}\) It is pragmatic, contextualized, and based on previously held beliefs.\(^ {123}\) In contrast, System 2 thought is often so abstract that people cannot use their previously held beliefs and so counterfactual that people must fight against their previously held beliefs.\(^ {124}\)

C. Propertizing Reflexive Thought

Claims that propertize reflexive acts of thinking raise the same problem of constructive nonvolition introduced above in Part I on a new scale that patent law has never previously confronted.

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120. Id. at 454.
121. See supra notes 72–73 and accompanying text.
122. EVANS & OVER, supra note 113, at 147.
123. Evans, Reasoning, supra note 113, at 989.
124. Id. The object of introducing the dual-process theory is not to scientify the law on constructive nonvolition in patent infringement cases involving reflexive-thought-propertizing claims. Courts grappling with such cases should not treat the classification of the claimed act of thinking as an example of System 1 or System 2 thought as dispositive of whether a thinker appropriated the entitlement with an involuntary or voluntary act, respectively. The System 1-System 2 distinction is not a strict dichotomy; the variables that distinguish the two systems are continuous, not binary. Kahneman & Frederick, supra note 113, at 288. Classifications are not even stable: a mental task can migrate from System 2 to System 1 for a particular thinker as a thinker becomes familiar with it. Id. at 268 (discussing automatism and giving the example of the "proverbial chess master who strolls past a game and quips, ‘White mates in three’"). Furthermore, the dual-process theory often suggests "both/and" rather than "either/or" answers. For many problems, System 1 provides snap judgments and offers a form of rough-and-ready, bias-prone thinking that leans heavily on factual context and previously held beliefs. System 2 kicks in after a time delay and corrects errors by undertaking a normatively driven and rule-based analysis of the problem. Daniel Kahneman & Shane Frederick, Representativeness Revisited: Attribute Substitution in Intuitive Judgment, in HEURISTICS AND BIASES: THE PSYCHOLOGY OF INTUITIVE JUDGMENT 51–52 (Thomas Gilovich et al. eds., 2002). Finally, the System 2 label may not be of much legal import at all. The light-bulb-in-the-shower myth of how people often solve complex puzzles when least expected suggests that people may not have the ability to turn their minds off and prevent themselves from engaging in System 2 thinking. A cognitive scientist's notion that thinking is volitional may be very different from a judge's notion that bodily actions are volitional. The latter notion involves legally purposive acts because people can choose both to perform and not to perform them.
To the extent that involuntary-act cases are contingent on trips, power outages, and fainting spells befalling the defendant, they are rare and monetarily insignificant. However, because the PTO is issuing reflexive-thought-propertizing claims, the extraordinary is no longer necessary to tell a story that involves an involuntarily performed, entitlement-appropriating act. Claims reciting reflexive acts of thinking describe a type of mental activity that includes a very high percentage of involuntarily performed and allegedly infringing act-of-thinking tokens.

Furthermore, involuntary appropriation of the entitlement described in a reflexive-thought-propertizing claim is made easier because the inventiveness of the method resides in the step that is commonly performed in an involuntary manner. If the inventiveness of the claim resides in a step that is by default performed deliberately, then only a deliberate act can appropriate the entitlement even if the claim also recites steps that are commonly performed reflexively. If it is the step that makes the method patentable that is commonly performed in a reflexive manner, however, a defendant who is doing nothing more than practicing the prior art is more likely to involuntarily appropriate the claimed entitlement. Reflexive acts of thinking are unusual in that they are both occasionally inventive and routinely performed involuntarily.

In sum, a defendant who performs the entitlement-appropriating act in an involuntary manner is no longer the exception. He or she may represent the norm in infringement actions involving reflexive-thought-propertizing claims.

125. See supra notes 72–73 and accompanying text (offering hypotheticals to illustrate constructive nonvolition in involuntary-acts cases).

126. More accurately, involuntarily acts appropriate the entitlement only in exceptional cases involving trips, power-outages, and fainting spells.

127. The heightened possibility of a reflexive act appropriating a patent entitlement is contingent on the reflexive act being the final act of a claim. The addition of a deliberate, noninventive step to a claim after the reflexive act of thinking can also eliminate routine, involuntary acts that appropriate the entitlement. See, e.g., infra text accompanying notes 210–11 (discussing thought-propertizing claims with post thought speech limitations).

128. An act of reasoning of a known type (e.g., a statistical syllogism) is arguably novel and nonobvious whenever it incorporates newly discovered and unexpected factual information as a premise. The only reason why the act of "correlating" in Claim 13 is novel and nonobvious is because the statistical generalization linking homocysteine and vitamin B12 was new and unexpected at the time of the invention.

129. The unusual nature of this combination is highlighted by the difficulty of a claim-drafting exercise in which the assignment is to formulate a method claim in which a reflexive bodily act such as "blinking" is the inventive step.
Not all defendants in infringement cases involving reflexive-thought-propertizing claims are constructively nonvolitional appropriators. Some thinkers who act involuntarily when their conduct is narrowly framed should be held liable as infringers. However, there will be quantitatively many more involuntary-act cases if the PTO continues to issue reflexive-thought-propertizing claims. The shift from extramental to mental activity as the referent of a patent claim radically increases what is at stake in a court’s decision to adopt or reject a constructive-nonvolition defense.

D. Two Types of Entitlements

This Section draws a distinction between two types of entitlements to reflexive acts of thinking: freestanding, reflexive acts of thinking and irrevocable bundles. The distinction is not a strict dichotomy. It establishes two poles of a spectrum that measures the degree of control that potential defendants can exercise in their attempts to avoid appropriating a patent entitlement. Even if idealized, this distinction proves useful for systematically grappling with the problem that constructive nonvolition raises vis-à-vis reflexive-thought-propertizing claims and identifying why Claim 13 of the '658 patent in particular is a special type of reflexive-thought-propertizing claim that merits closer attention.

1. FREESTANDING, REFLEXIVE ACTS OF THINKING

Some reflexive-thought-propertizing claims create entitlements to freestanding, reflexive acts of thinking. Consider a method claim that only recites the “correlating” step of Claim 13. This truncated version of Claim 13 is as novel and nonobvious as the real Claim 13.131 A doctor infringes this hypothetical, one-step variant of Claim 13 in many situations. The doctor might read the results of an individual’s homocysteine test published in a newspaper or on a chart of another doctor’s patient. The doctor might remember the results of a

130. See supra text accompanying note 87 (presenting the Jane hypothetical in an involuntary-act case).

131. Even if the courts were to hold that Claim 13 recites patentable subject matter under section 101, they might conclude that this hypothetical, one-step variant of Claim 13 does not. See In re Comiskey, No. 2006-1286, 2007 WL 2728361, at *10 (Fed. Cir. Sept. 20, 2007) (invalidating a broad claim reciting a business method that can be performed without a machine under the mental-steps doctrine).
homocysteine test performed at some point in the past. Patients might even infringe if they learn of both their own homocysteine test results and the statistical generalization linking vitamin B12 and homocysteine.

If strict liability is equated with absolute liability, an entitlement to a freestanding, reflexive act of thinking is essentially an entitlement to others' involuntary conduct. The conduct described by the claim is performed involuntarily in a narrow time window, and potential defendants have no reasonable degree of control over their ability to avoid mental exposure to the information that triggers the claimed, reflexive act.

The need for a constructive-nonvolition exemption for appropriators of entitlements to freestanding, reflexive acts of thinking is self-evident. A per se entitlement to others' involuntary conduct produces a property regime that is riddled with Pareto-inferior, judicially forced exchanges, violating both the reward and baseline principles. Because the equation of strict liability and absolute liability is absurd with respect to claims to freestanding, reflexive acts of thinking, this Article gives such claims no further attention.

132. Reflexive-thought-propertizing claims that do not recite data-gathering steps raise an additional "counting" problem: if a doctor reads the results of a homocysteine test and then recalls the results an hour later, has the doctor infringed once or twice?

133. Rather than looking for constructive nonvolition on a case-by-case basis, the courts may invalidate all claims that can be routinely appropriated through involuntary acts and head off the costs of administering a constructive-nonvolition exemption at the pass. See infra text accompanying note 208.

134. Although it eventually proves unsuccessful, the most honest attempt at a justification for a rule of per se liability for appropriating entitlements to freestanding, reflexive acts of thinking sounds in restitution, not property. Defined broadly, restitution is the law of "benefit-based recovery." HANOCH DAGAN, THE LAW AND ETHICS OF RESTITUTION 1 (2004). As Professor Wendy Gordon has illustrated, the plight of the producer of information goods who receives no intellectual property protection can readily be analogized to the plight of a plaintiff in restitution. See Gordon, supra note 37, at 463 (framing an author seeking compensation as a plaintiff in restitution); Wendy J. Gordon, On Owning Information: Intellectual Property and the Restitutionary Impulse, 78 VA. L. REV. 149, 221–66 (1992) (arguing that a slimmed-down version of copyright can be justified by the law of restitution).

The story that portrays the inventor of a reflexive act of thinking as a plaintiff in restitution casts the inventor who publishes inventive information as a bestower of a benefit on the public. The public is usually better off after having learned the inventive information than it was before, even if the marginal benefit provided by the information is a small one. The public that learned the inventive information and that put it to use by thinking about it, however, did not request the benefit. There is no contract. The inventor, therefore, must sue in restitution, argue that the reflexively thinking public has been unjustly enriched at the inventor's expense, and demand payment.

The inventor faces an uphill battle attempting to convince the court that he or she is a meritorious plaintiff in restitution. Restitution frowns on plaintiffs like the inventor.
When the bestower of an unrequested, nonmonetary benefit seeks recovery from the benefited party, the bestower is dismissed as a "volunteer" or "officious intermeddler" without recourse in the law. John P. Dawson, *The Self-Serving Intermeddler*, 87 Harv. L. Rev. 1409, 1409 (1974); Restatement (Third) of Restitution and Unjust Enrichment § 23 & cmt. a (Tentative Draft No. 2, April 1, 2002). The strong, negative rule against restitution is traditionally justified based on the need for the courts to respect the benefited parties' autonomy- and efficiency-enhancing freedom to order their own priorities. Dagan, supra, at 140–41. Markets and the voluntary exchanges that they entail, not judicially forced exchanges, are the preferred means of facilitating the exchange of goods. Saul Levmore, *Explaining Restitution*, 71 Va. L. Rev. 65, 68–69 (1985) ("[T]he general law of restitution seeks to encourage private bargaining rather than to replace it with judicial intervention."). The courts should not force John to compensate someone who comes and paints his house while he is on vacation. John should be able to decide when his house gets painted and choose the services that best match his price and quality preferences. Furthermore, if anyone who paints his house gets paid in restitution, a competitive market for house-painting services never develops.

This traditional justification of the officious intermeddler rule, however, leaves the inventor of the reflexive act of thinking with room to argue that he or she deserves an exception. A justification of the officious-intermeddler rule that relies on the rule's role in facilitating private bargaining cannot explain the inventor's inability to recover in restitution. The inventor is in a different position than the house painter. Denying the inventor a right to recover in restitution will not create a robust market for inventive information. Inventive information is a public good, see supra note 19, and the market failures associated with public goods are well known. An inventor cannot identify the people who value his or her inventive information before he or she invents it, and, even if the proper parties could be identified, contracting for the delivery of information that does not yet exist is not a simple task. See Gordon, supra, at 233–38 (discussing the search costs and strategic bargaining problems that confront authors who try to reach ex ante contracts guaranteeing payment for their works). Nor will eventual consumers of inventive information know to seek out an inventor because, by definition, they don't know about the inventive information before the invention occurs. The inventor may therefore reasonably argue that voluntary exchanges of inventive information in a market based on ex ante contracts are not feasible and that an exception to the rule against recovery in restitution for the bestowal of unrequested benefits should apply and allow him to recover the benefit that he or she bestows on involuntary thinkers.

The inventor would not be the first to explore such an exception. In his book on restitution, Hanoch Dagan proposed a "collective-goods" exception from the general, negative "officious intermeddler" rule of restitution when the benefit in question involves significant externalities vis-à-vis the benefit-provider and a collective action problem is likely to prevent a market for the provisioning of the good from developing. Dagan, supra, at 130–48 (defending a collective-goods exception that is not reflected in contemporary doctrine). At the end of the day, however, even Dagan's collective-goods exception would not help the inventor of the reflexive act of thinking in his plea to the court. Dagan imposes two restrictions on his exception, and the inventor cannot satisfy either.

First, Dagan argues that recovery in restitution for an unrequested benefit under the collective-goods exception can only be justified if it is "objectively clear that . . . defendants' proportionate benefit exceeds the cost to them of contributing the proportionate share of the cost of supplying the benefit." Id. at 135. Patent damages have no relation to the cost of producing the inventive information, see supra note 21 and accompanying text, so the patent law reward that the inventor seeks for the benefit
2.

IRREVOCABLE BUNDLES

Claim 13 of the '658 patent is a special type of reflexive-thought-propertizing claim because it satisfies three conditions. First, a data-gathering step limits the scope of the claim. A doctor only infringes Claim 13 if he or she initially tests for homocysteine and then correlates. Second, the data-gathering act is by default deliberate and deterrable. Third, the act of thinking always follows the gathering of

is not related to his "cost of supplying the benefit." Furthermore, involuntary thinkers are likely to subjectively devalue the benefit obtained from the inventive act of thinking in relation to the traditional patent law remedy. The collective-goods exception is appropriate (and subjective devaluation is low) only when the interests of the plaintiffs and defendants in restitution are "locked in." DAGAN, supra, at 131. When the plaintiff and defendants are locked in, the agency costs—the costs generated when "decisions by the agent . . . deviate from the decisions which would have been made by the principal if he had the same information and talents as the agent"—are low. Id. at 138-49 (quoting 1 THE NEW PALGRAVE: A DICTIONARY OF ECONOMICS 39 (John Eatwell et al. eds., 1987)) (internal quotations omitted). Rarely are the interests of an inventor of a reflexive act of thinking locked in with all of the people who reflexively perform the act of thinking.

Second, Dagan argues that recovery in restitution under the collective-goods exception is only appropriate if the cause of action in restitution is the likely but-for cause of the production of the benefit. Id. at 131, 135. There is nothing inherently inefficient or wrong with positive externalities that go uninternalized. Dawson, supra, at 1412 ("Uncompensated gains are pervasive and universal; our well-being and survival depend on them."); Gordon, supra, at 167-69 (arguing that "[c]ulture is interdependence" and that free riding is not inherently wrongful); Lemley, supra note 23, at 1046-69 (defending the efficiency-enhancing role of free riding in intellectual property). Welfare spillovers are detrimental only if they are sufficiently large to destroy the incentive of any individual (or group capable of concerted action) to generate a good or benefit. DAGAN, supra, at 131 (arguing that restitution should be employed to solve a collective-action problem "only in types of cases where freeriding may frustrate the possibility of achieving the collective good itself" absent recovery in restitution); Lemley, supra note 23 (arguing that intellectual property is justified only to the extent that it is necessary to encourage invention). It is highly questionable whether recovery by patentees from constructively nonvolitional appropriators is necessary to ensure the production of a distinct class of information. If patent protection were to be denied in an entire industry such as biotechnology, then a particular class of inventive information might not be produced. However, when the additional protection sought is recovery from constructively nonvolitional thinkers, it is entirely possible that the patentee is merely trying to internalize spillovers from an otherwise profitable venture. The underlying information protected by claims to freestanding, reflexive acts of thinking may be partially protected by enforcement against appropriators who do not fall within the constructive-nonvolition exemption and by other, traditional patent claims. Cf. supra text accompanying note 99 (noting that the researchers who discovered the vitamin B12 correlation also invented a patentable method of assaying for homocysteine).

135. Claim 13 may be appropriated nonvolitionally under exceptional circumstances. An overworked and underslept resident might scribble in a box on a diagnostic form in a state of automatism and thus order a homocysteine test. The
the data that enables the reflexive thought. When these three conditions exist, the entitlement described by the claim is an irrevocable bundle of a data-gathering step and the inventive, reflexive act of thinking. If a claim describes an irrevocable bundle rather than a freestanding, reflexive act of thinking, the entitlement at issue need not be viewed as an entitlement to others' involuntary conduct. The entitlement describes the data-gathering–act-of-thinking bundle and is appropriated by a deliberate act in all but exceptional cases.

The concept of an irrevocable bundle conceptually reframes what the inventor has actually invented. Like an alien invader or virus, the reflexive nature of the act of thinking incorporates the act of thinking into the very being of preexisting data-gathering technology from the date of invention forward. Although the data-gathering step existed before the discovery of the reflexive act of thinking, the two cannot be separated after the discovery (and after exhaustive publication of the statistical generalization that enables the reflexive act of thinking). It is entirely beyond the power of a doctor who gathers data about an individual's homocysteine level to perform the data-gathering step without also performing the reflexive act of thinking. The doctor cannot order a different product that does not have the vitamin-deficiency diagnosis feature; the reflexive act of thinking cannot be removed from the product through redesign. The doctor cannot even contractually agree not to engage in the act of thinking. There is neither a physical nor a legal means to dissociate the data-gathering step from the act of thinking.

The act of invention coupled with widespread publication irrevocably transforms what had been a plain old homocysteine test into the test bundled together with the reflexive act of thinking. The theory of an irrevocable bundle is similar to the polymorph and seeding theories put forward in SmithKline. Before the invention of Form Two PHC, Form One PHC was available as a distinct product. From the date of the invention forward (with a bit of a lag to allow the seeding process to take place), Form One only existed in a bundle with trace amounts of Form Two. A reflexive-thought-propertizing claim that marks an entitlement to an irrevocable bundle accomplishes this

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remainder of this Article ignores this exceptional case and presumes that only deliberate acts appropriate claims to irrevocable bundles.

136. A doctor may, however, contractually agree not to express or act on the conclusion of the reflexive act of thinking. Cf. infra text accompanying notes 210–11 (discussing reflexive-thought-propertizing claims with express speech limitations).

137. See supra text accompanying note 53 (describing SmithKline's polymorph theory).
end by using the human mind as an intermediate entity to indelibly bond an inventive act of thinking onto a preexisting data-gathering step.

There are several reasons for examining entitlements to irrevocable bundles as a category that is distinct from entitlements to freestanding, reflexive acts of thinking. Most significantly, if the bundle itself is the invention, then requiring potential defendants to avoid performing the data-gathering step is not a request that is overbroad with respect to what is required to avoid appropriating the entitlement. The immediate act of appropriation is by default willed and deterrable. In other words, entitlements to irrevocable bundles give rise to deliberate-act, not involuntary-act, cases, and the red flag for a constructive-nonvolition exemption arguably flies lower in the deliberate-acts cases. Claims to irrevocable bundles also appear to be the type of reflexive-thought-propertizing claims that are most commonly sought by patent applicants and issued by the PTO. “Test and correlate” claims are commonplace in the medical profession, and they provide a template that can be used in any field of technology. In part, the empirical prevalence of claims to irrevocable bundles may flow from the fact that that claims to freestanding, reflexive acts of thinking wear the problems of constructive nonvolition and the propertization of thought on their sleeves. In part, it may flow from the lower cost of monitoring for infringement. The thinkers’ requests for the relevant data can often meter infringement of an irrevocable bundle. Finally, claims to irrevocable bundles merit special attention to shine light on the constructive-nonvolition problem in the very form that confronted and bested the Supreme Court in Laboratory Corp.

IV. IRREVOCABLE BUNDLES AND LABORATORY CORP.

This Part argues that claims to irrevocable bundles are overbroad without a constructive-nonvolition exemption from liability for patent

138. See supra note 88.

139. For example, a district court recently addressed a claim to a method of detecting autism comprising the steps: “obtaining” a sample, “analyzing” the sample for the presence of certain compounds, and “correlating the quantity of ... at least one compound with an autism condition or lack thereof in said patient.” Great Plains Lab., Inc. v. Metrametrix Clinical Lab., No. 04-2125, 2006 WL 2663680 (D. Kan. Sept. 15, 2006) (construing the term “correlating”); U.S. Patent No. 5,686,311, cols. 16–17 (Nov. 11, 1997); see also Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 126 S. Ct. 2921, 2929 (2006) (Breyer, J., dissenting) (noting that the Solicitor General opined that the Court’s ruling in Laboratory Corp. would affect a “substantial number of patent claims”).

140. Collins, supra note 2, at Part II (demonstrating that Claim 13 of the ’658 patent is a template for an array of thought-propertizing claims that spans different fields of technology).
infringement. It contrasts the conventional story of a complement good that is an improvement on existing technology with the story that casts an irrevocable bundle as an improvement. It illustrates the distinct problems of economic and constitutional overbreadth that result if courts equate strict liability with absolute liability. It analyzes the lower courts' treatment of a claim to an irrevocable bundle in Laboratory Corp., emphasizing both the overbreadth that resulted from the lower courts' rulings and the intricate nature of the factual inquiry that is required to distinguish infringers from constructively nonvolitional appropriators.

A. Irrevocable Bundles and Improvement

An irrevocable bundle is an unusual kind of improvement invention. It overrides a fail-safe mechanism on which patent law relies to police both the reward and baseline principles.

To understand the novelty of an irrevocable bundle (both in the patent law sense of novelty and in the sense of the newness of the legal problem that an irrevocable bundle creates), it is helpful to think about the data-gathering step and the reflexive act of thinking as distinct goods. The noninventive data-gathering step is good X, and the inventive reflexive act of thought is good Y. In Claim 13 of the '658 patent, good X is the act of testing for homocysteine, and good Y is the mental act of using the vitamin B12 correlation to diagnose the patient. Good Y is an improvement invention in the sense that it makes good X more valuable and increases demand for good X, but not in the sense that good Y supplants sales of good X. In other words, good Y is an improvement on good X in the form of complement rather than a substitute. Furthermore, good Y is a perfect complement to good X because good Y can only be used in conjunction with good X. A doctor can only perform the correlating step after testing for homocysteine.

141. But cf. infra text accompanying notes 154-55 (noting that X and Y are not distinct goods in an economic sense if they are perfect, mutual complements).

142. Complement goods tend to be used together. Two goods are mutual complement goods if a decrease in price of good X increases demand for good Y and vice versa. In contrast, substitute goods tend to be used in the alternative. Two goods are mutual substitute goods if an increase in the price of good X increases the demand for good Y and vice versa. Pindyck & Rubinfeld, supra note 19, at 25-26, 34-35, 109-10.

143. Id. at 70.

144. If good Y were not the act of thinking about the vitamin B12 correlation required to diagnose a patient but instead were an act of thinking about the vitamin B12 correlation generically, it would not be a perfect complement.
Invention scenarios involving goods like X and Y (at least as described so far) are well-known staples of patent law. Preexisting good X can be a pencil and inventive good Y can be a wedge-shaped eraser cap that fits over the nonwriting end of the pencil. The invention of the eraser cap increases demand for the pencil because the pencil is now a more useful object, and the eraser cap is, for all practical purposes, useless without the pencil. Good Y can just as well be a better pencil sharpener, a chemical that is only useful for producing a yellow, graspable coating for pencils, or a new method of using a pencil (but not a pen) to perform calculus rapidly.

In these traditional, complement-good invention scenarios, good X is not physically changed by the invention of good Y, and it remains a market option after the invention of good Y. Pencils still exist after the invention of eraser caps. When good X is a data-gathering step and good Y is a reflexive act of thought that together form an irrevocable bundle, however, good X does not remain a market option after the invention of good Y. The very invention and publication of the reflexive act of correlating irrevocably transforms the data-gathering step into a data-gathering–reflexive-act-of-thinking bundle. After the invention of good Y, good X ceases to exist, and only good XY exists. With respect to Claim 13, the invention of the act of correlating homocysteine and B12 vitamins makes the purchase of the homocysteine test “neat” a factual impossibility. Only the homocysteine-test-act-of-correlating-to-B12-vitamins bundle persists in the postinvention world.

Recounting the traditional invention scenario in a manner that captures the nature of an irrevocable bundle requires narrating the story in a “Bizzaro World.” It is as if the very invention of the eraser cap miraculously, physically, and indelibly bonds eraser caps onto all of the ordinary pencils that will ever be manufactured. Irrevocable bundles created by the invention of a reflexive act of thought raise an unprecedented factual scenario of invention in which perfect complement goods that improve on preexisting goods are factually compulsory.

In the traditional complement-good improvement scenario, the continued availability of the unimproved good is a fail-safe that

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145. The required assumption is that nobody uses an eraser cap to erase unless it is on the end of a pencil. An eraser cap might be small and therefore, unlike a normal eraser, difficult to hold while erasing.

146. The plaintiff’s allegations in SmithKline fit nicely into this “Bizzaro World.” See supra notes 52–53 and accompanying text. However, the Form Two (good Y) improvement in SmithKline is a substitute rather than a complement for Form One (good X).
prevents violations of both the reward and baseline principles. Any claim that is justified by the inventiveness of good Y, yet is broad enough to afford the patentee monopoly power in the market for preexisting good X, is invalid for lack of novelty or nonobviousness. A patent based on the invention of the eraser cap does not normally affect the public’s right to enter the market for pencils without eraser caps.

When the improvement good Y is irrevocably bundled with the preexisting good X, however, the preexisting good X does not remain a market option after the invention of the improvement. After the improvement invention, the preexisting good X no longer exists as an independent thing. The fail-safe protection for the reward and baseline principles malfunctions. Anyone who desires to use good X must purchase good XY because good XY is the only form in which good X persists in the postinvention world. Furthermore, a claim to the irrevocable XY bundle that affords the patentee monopoly power in the market for good X is not invalidated by the novelty or nonobviousness doctrines. The presence of good Y in the bundle assures the inventiveness of the claim to the XY bundle, just like the presence of the inventive eraser cap in the pencil-and-eraser-cap ensures the inventiveness of that combination. As with other constructive-nonvolition cases, the potential problem is not a problem of the figure of the claim being too large on its face vis-à-vis what is new but a problem with the ground beyond the reach of the claim being too small.

B. Economic Overbreadth

An entitlement to an irrevocable bundle is often economically overbroad unless a court recognizes a constructive-nonvolition exemption to liability for patent infringement. Data-gathering steps in irrevocable bundles vary along a continuous spectrum from purely monovalent (those rare activities that are useful only for a single purpose, namely to perform the reflexive act of thought) to highly polyvalent (those more common activities that are useful for diverse purposes). An entitlement to an irrevocable bundle that incorporates a polyvalent data-gathering step violates the reward principle if strict liability is equated with absolute liability. The overbreadth is eliminated, however, if courts do not subject constructively nonvolitional appropriators to liability. In contrast, an entitlement

147. See supra Part II.A.1–2 (explaining the reward and baseline principles).

148. The economic overbreadth implicates both the reward and baseline principles because it extracts payments from people who are trying to practice privileges that they value and possess in PW1.
incorporating a purely monovalent data-gathering step is not overbroad in an economic sense in the first place.

If the inventor claims an irrevocable bundle, the data-gathering step is polyvalent, and defendants are per se liable whenever they appropriate the inventor’s entitlement to an irrevocable bundle, then the inventor’s right to exclude is broader than what can be justified by the reward and baseline principles. As the following figures illustrate, the inventor’s monopoly power derives in part from demand for technology that the inventor did not actually invent:

Good X is a preexisting good (e.g., a data-gathering step), and goods Y and Z are perfect complement goods (e.g., acts of applied reasoning that both use the data generated by good X as a premise but that are useful for distinct purposes). Good X is polyvalent because goods Y and Z are both perfect complement goods. Figure 3a depicts demand in a hypothetical world in which good X “neat” continues to exist as a factual matter after the invention of goods Y and Z. In this world, the intentional bundles X+Y and X+Z have their own, unique demand curves. Consumers’ willingness to pay for X+Y determines the reward that the inventor can reap from acting as a rational monopolist of good Y. The inventor’s profit is unaffected by the

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149. The intrinsic value of good X, in addition to its use in a patented method, may render good X polyvalent. However, goods in this part are sliced so finely that an applied act of thinking is a good that is distinct from the test that produces the data being thought about, so the contrast of X+Y and X+Z is more in line with the spirit of the exercise.

150. To further the parallel to an irrevocable bundle, the argument presumes that the owner of a patent on good Y can monopolize the intentional, nonirrevocable X+Y bundle. If good Y is a perfect complement of good X and the market for good X is competitive, this presumption is justified because the profits from monopolies on Y and X+Y are usually identical. Under these circumstances, patentees who “tie” the sale of good Y to good X do not increase their monopoly profits. They merely leverage their market power into a larger number of sales of good X (pencils) at a competitive price based on their monopoly power in the market for good Y (eraser caps). However, a patentee who invents and claims good Y yet who sells only the X+Y bundle may run
demand for good Z, assuming that goods Y and Z are neither substitute nor complement goods. Figure 3b tells a different story. It illustrates what happens when the invention of good Y results in a good XY irrevocable bundle. The demand curve for the irrevocable bundle XY in Figure 3b is the horizontal sum of the two demand curves in Figure 3a. Good X plain and simple no longer exists, so consumers who desire Y must purchase XY and consumers who value Z must purchase the bundle XY+Z (or XYZ if Z, too, irrevocably bundles itself to X). The owner of the entitlement to the irrevocable bundle profits from consumers who desire only good Z (or bundle X+Z), a good that does not embody the inventive information produced by the patentee. Furthermore, consumers who value good Y pay more to the patentee when irrevocable bundling occurs than when it does not occur. This result both shifts surplus from consumers to producers and generates additional dead-weight loss.

The more polyvalent the technology and the further good Z proliferates into goods Z1, Z2, and Z3, the more egregious the violation of the reward principle is likely to be. In the same vein, the less

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afoul of the tying doctrines in both patent misuse and antitrust law if the markets for X and Y are distinct and the patentee has market power in the market for good Y. See Virginia Panel Corp. v. Mac Panel Co., 133 F.3d 860, 869 (Fed. Cir. 1997) (stating the per se rule for tying under patent misuse); 9 AREEDA, supra note 36, ¶ 1702 (noting that an "anticompetitive effect" or "some relevant foreclosure" in the market for the tied good is required for an actionable tying offence under the antitrust laws).

151. The demand for the irrevocable bundle that incorporates a polyvalent data-gathering step can be obtained through horizontal summation if the group of consumers represented on the demand curve for X+Y has no overlap with the group of consumers represented on the demand curve for X+Z. PINDYCK & RUBINFELD, supra note 19, at 116–17. In the context of Claim 13, horizontal summation is appropriate even if the same doctor appears on both curves, but only if the doctor performs the two homocysteine tests on different patients (and wealth effects are ignored). However, if a single doctor-patient pairing is represented on both demand curves, then that consumer’s demand in the possible world with irrevocable bundling should be calculated through a vertical, not horizontal, summation of the demand curves willingness. Cf. infra note 165 (considering consumers with mixed motives).

152. In the “Bizzaro World” hypothetical involving the irrevocable bundling of a pencil and an eraser cap, see supra text accompanying note 146, irrevocable bundling allows the inventor of the eraser cap to profit from pencils purchased by people who place no value on eraser caps such as writers who never make mistakes and model enthusiasts who use pencils to build log cabins. To add insult to injury, these pencil purchasers must pay the inventor of the eraser cap a supracompetitive price that reflects monopoly control over the entire market for pencils, not merely the price that could have been earned by a monopoly in the market for severable eraser caps. But cf. infra note 153 (describing situations in which a monopoly on an irrevocable bundle lowers the price and increases the consumption of the inventive, complement good).
valuable the inventive, complement good Y is relative to the noninventive, complement good Z, the more egregious the violation.\footnote{153}

In contrast, if the noninventive data-gathering steps incorporated into an irrevocable bundle are purely monovalent, then an entitlement to the irrevocable bundle never violates the reward principle. When good X is purely monovalent, good X and good Y are perfect, mutual complements; there is no demand for one without the other. In economic terms, X and Y are not even distinct goods in this situation.\footnote{154} There is no area under the demand curve for good X+Z in Figure 3a, so the demand curve for the irrevocable bundle XY does not move when the two demand curves are summed in Figure 3b. The public is economically indifferent to the disappearance of good X* plain and simple and the replacement of good X by good XY in the postinvention world.\footnote{155}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure3c.png}
\caption{FIGURE 3c}
\end{figure}

The rational monopolist charges a lower price for the irrevocable XY bundle than he or she does for the intentionally bundled good X+Y in the closest possible world without irrevocable bundling. However, the reward-principle violation that results from the irrevocable bundling is much more severe. There is nothing inherent in the factual-legal conception of an irrevocable bundle that suggests that irrevocable bundles will create problems that resemble Figure 3b more closely than they resemble Figure 3c. The Figure 3c problems, however, are more likely to make a judge at least raise an eyebrow before equating strict liability with absolute liability.

\footnote{154} Cf. 10 Areeda, supra note 36, ¶¶ 1743a, 1751e (evidence of buyer interest in a separate product is necessary to allege that two distinct products are tied together). A common example of perfect, mutual complements is a pair of shoes, left and right.

\footnote{155} But cf. infra Part IV.C (suggesting that irrevocable bundles that incorporate purely monovalent goods might be constitutionally overbroad even if they are not economically overbroad).
The fact that irrevocable bundles incorporating purely monovalent data-gathering steps are not economically overbroad, however, does little to make the genus of reflexive-thought-propertizing claims as a whole more palatable. Data-gathering technologies are unlikely to be purely monovalent for three reasons. First, the data-gathering step is never inventive in a thought-propertizing claim. Few technologies will exist in a state of absolute economic uselessness prior to the invention of a complement, improvement good. Second, the data-gathering step must remain purely monovalent throughout the term of the patent. If a data-gathering step is purely monovalent at the time of invention but becomes polyvalent during the term of the patent, an entitlement to an irrevocable bundle is economically overbroad prospectively from the time the polyvalence develops.

Third, a purely monovalent technology entails a restrictive definition of uselessness. In patent law, the courts and the PTO interpret the utility requirement to allow patents on any compound that has a "specific and substantial utility." Viewed in the negative, compounds that are only useful as inputs into further research to achieve as-of-yet insufficiently specified goals are legally useless and unpatentable. This utility-doctrine definition of uselessness, however, is much broader than an economic definition of uselessness. The value that the research community places on a technology as an input into ongoing research activities demonstrates that the technology has an economic use even if it does not have a use that is recognized by the utility doctrine. More concretely, it is possible to conclude that homocysteine tests have doctrinal utility only for diagnosing vitamin B12 deficiencies and nonetheless also conclude that homocysteine tests are not purely monovalent technologies. Consumer demand for use of homocysteine tests in ongoing commercial research to develop new correlations for homocysteine makes the homocysteine test a polyvalent data-gathering step in an economic sense. A research-oriented use for

156. See supra text accompanying note 102 (defining the propertization of thought).
157. The economic overbreadth that results after the discovery of new uses for data-gathering steps that previously had been purely monovalent reaffirms that constructive nonvolition must be measured in relation to all privileges in PW1, not only in relation to privileges in the prior art. See supra notes 32–34 and accompanying text (defining the contents of PW1).
159. See Brenner v. Manson, 383 U.S. 519, 534–36 (1966) ("[A] patent is not a hunting license.").
160. The narrowness of the category of "purely monovalent data-gathering steps" also needs to be distinguished from the related-yet-broader category of
good X means that goods X and Y are not perfect, mutual complements.\textsuperscript{161}

Entitlements to irrevocable bundles are economically overbroad if they allow an inventor to profit from demand for all of the uses of a polyvalent technology that the inventor did not actually invent. A constructive exemption from liability for patent infringement, however, rectifies the economic overbreadth problem.\textsuperscript{162} Constructive nonvolition lets a defendant who appropriated a patent entitlement off the hook if the cost to the defendant of reducing the benefit obtained from the appropriation requires that the defendant retreat from the baseline of privileges possessed and valued in PW1.\textsuperscript{163}

This standard effectively requires a court to determine which of the two demand curves in Figure 3a reflects a particular defendant’s initial...
willingness to pay for the irrevocable bundle.\textsuperscript{164} On the one hand, if a court decides that an appropriator of the irrevocable XY bundle performed X because the appropriator valued Z, the appropriator can succeed in proving a constructive-nonvolition defense. Both goods X and Z exist in PW1. The cost to the defendant of reducing the benefit obtained from good Y reflects not only the opportunity cost of avoiding good Y but also the cost of forgoing the use of X+Z. On the other hand, if a court decides that an appropriator of the irrevocable XY bundle ordered X because the appropriator valued X+Y, then the appropriator is an infringer. Because the defendant did not value Z, the cost of not appropriating is no more than the opportunity cost of practicing the art that exists in PW1.\textsuperscript{165}

To the extent that the reason for the existence of willingness to pay can be equated with intent, the courts must determine the defendant’s intent in order to address constructive nonvolition. Intent, however, is not used to identify innocent infringers. The defendant’s knowledge of the patent and reasonable belief in its invalidity remain irrelevant.\textsuperscript{166} Discovery of the relevant intent requires an inquiry into the defendant’s motivation or purpose that gives rise to willingness to pay.

\textbf{C. Constitutional Overbreadth}

Economic overbreadth is not the only repercussion of a court’s failure to recognize a constructive-nonvolition exemption from liability for patent infringement when a reflexive-thought-propertizing claim describes an irrevocable bundle. If courts equate strict liability with absolute liability, an entitlement to an irrevocable bundle unconstitutionally propertizes the prior art.

The Constitution does not give Congress the power to privatize the technological status quo. The Copyright and Patent Clause grants Congress the power “[t]o promote the Progress of . . . useful Arts, by securing for limited Times to . . . inventors the exclusive Right to their

\textsuperscript{164} In addition, a court must examine the defendant’s postappropriation behavior to see if the defendant could have reduced the benefit obtained from the appropriation. \textit{See infra} text accompanying note 207.

\textsuperscript{165} More difficult questions arise when defendants have mixed motives. These defendants were assumed out of existence by the horizontal summation of the demand curves in Figure 3a to create Figure 3b. \textit{See supra} note 153. Insofar as economic overbreadth is concerned, mixed-motive appropriators who would have been willing to pay the going price for good X+Z in PW1 should be constructively nonvolitional appropriators even if their willingness to pay for the irrevocable bundle in the actual world is attributable in part to a desire for good Y. \textit{But cf. infra} note 170 (discussing defendants with mixed motives and constitutional overbreadth).

\textsuperscript{166} \textit{See supra} note 5 (discussing innocent infringers).
... Discoveries," and the Supreme Court has interpreted this clause to mean that "Congress may not authorize the issuance of patents whose effects are to remove existent knowledge from the public domain, or to restrict free access to materials already available."  

A per se right to exclude from an irrevocable bundle does precisely what the Court has prohibited Congress from doing. A noninventive data-gathering step (good X) is by definition unpatentable prior to the time of the invention. After the invention of a reflexive act of thinking (good Y), the data-gathering step cannot be performed without also performing the reflexive act of thinking. Only the irrevocable bundle (good XY) exists. A right to exclude from the bundle therefore restricts the availability of the preexisting data-gathering step (good X). If X+Z is in the prior art, then a patent that is justified by the discovery of good Y cannot take the ability to practice X+Z away from the public.

A constructive-nonvolition exemption from liability for patent infringement is required to ensure that the prior art is not propertized with the infringing product.
unconstitutionally privatized. However, the constructive-nonvolition exemption that is required to prevent constitutional overbreadth is likely narrower than the exemption that is required to remedy economic overbreadth. To the extent that the constitutional-overbreadth problem derives from propertization of the prior art and not PW1 art, technological advances that occur after the invention of the reflexive act of thinking are irrelevant to a constitutionally required constructive-nonvolition exemption. A restriction on PW1 art that is not prior art does not raise a constitutional issue.

D. Laboratory Corp. of America Holdings v. Metabolite Laboratories, Inc.

In Laboratory Corp. of America Holdings v. Metabolite Laboratories, Inc., the lower courts failed to identify all of the constructively nonvolitional appropriators of Claim 13 of the '658 patent. They granted the patentee protection that was both economically and constitutionally overbroad. To locate the point at which the courts

171. The Supreme Court's holding in Dawson Chemical Co. v. Rohm & Haas Co., 448 U.S. 176 (1980), does not conflict with this conclusion. In Rohm & Haas, the Court held that a patentee can sue an unlicensed distributor of an unpatented, nonstaple technology for contributory infringement without committing patent misuse. Id. at 176. Rohm & Haas involved a patent claim to a method of using a prior-art chemical as an herbicide when no other substantial, noninfringing use for the chemical was known. The patentee sought to become the sole distributor of the chemical, and it sued other distributors for contributory infringement. The Court concluded that the patentee did not misuse its patent rights in seeking to become the sole distributor of the nonstaple, unpatented chemical. Id. at 220 (noting that the patentee's conduct "affect[ed] only the market for the invention itself"). The patentee's conduct in Rohm & Haas sanctioned by the Court did not take away from the public any rights to use the chemical that it already possessed. Contributory infringement imposes secondary liability only when the distributor sells the nonstaple chemical to a customer who performs the patented method. See supra note 160. Contributory liability does not prevent the manufacture of the unpatented chemical and its sale to noninfringing users (e.g., experimenters who are searching for new uses for the chemical and who do not use it as an herbicide). Rohm & Haas merely allows a patentee to control markets for the sale of unpatented products to infringing customers. In contrast, a claim to an irrevocable bundle allows the patentee to control all uses of the pre-existing technology—including the insubstantial ones—if no constructive-nonvolition exemption exists.

172. The constitutional overbreadth of an irrevocable bundle may in another way also be broader than its economic overbreadth. Irrevocable bundles incorporating data-gathering steps that were purely monovalent prior to the invention are constitutionally overbroad if the public seeks to use the data-gathering step alone. However, given the narrow definition of a purely monovalent data-gathering step, see supra notes 156–61 and accompanying text, cases involving defendants who seek to use purely monovalent data-gathering steps for their own sake will be rare.

took the wrong turn, this Section summarizes the judicial proceedings and analyzes the lower courts’ holding in two steps, first with a simplifying assumption and then with the actual facts of the case.

1. COURT PROCEEDINGS

_Laboratory Corp._ brought a patent case involving a reflexive-thought-propertizing claim all the way to the Supreme Court, but neither the thought-propertizing nature of the claim nor the possibility of constructive nonvolition were expressly raised in the proceedings.

The doctors—the involuntary thinkers and alleged direct infringers of Claim 13—were not present in the courtroom. The defendant was Laboratory Corporation of America ("LabCorp"), a company that provides blood analyses, including homocysteine tests, for medical doctors. The exclusive licensee of the '658 patent, Metabolite Laboratories ("Metabolite"), sued LabCorp on a theory of secondary liability, alleging that LabCorp was monetarily responsible for the doctors’ direct infringements because its homocysteine-test services aided and abetted the doctors’ infringing conduct. The district court held LabCorp liable for both contributory liability and active inducement, two different theories of secondary liability, but the Federal Circuit affirmed only on the basis of active inducement.

In calculating damages, the district court and the Federal Circuit both concluded that all doctors who ordered the homocysteine test from LabCorp directly infringed Claim 13. This conclusion on damages involves distinct factual and legal components.

Factually, the district court found that all doctors who ordered homocysteine tests performed the mental act of correlating required to diagnose a vitamin B12 deficiency. In other words, all doctors who performed the homocysteine test appropriated the patentee’s entitlement. The Federal Circuit affirmed, finding support in the record for this factual conclusion in the idea that “it would be malpractice for a doctor to receive a total homocysteine test without determining [a vitamin B12] deficiency.”


175. The court calculated LabCorp’s damages based on all homocysteine tests that LabCorp performed. Metabolite Labs., 370 F.3d at 1364. Because nobody is ever secondarily liable in the absence of direct infringement, see Standard Haven Prods. v. Gencor Indus., 953 F.2d 1360, 1374 (Fed. Cir. 1991) ("[T]here can be no inducement of infringement or contributory infringement . . . in the absence of direct infringement."), the court necessarily concluded that all doctors who ordered LabCorp’s homocysteine tests were direct infringers.

176. Metabolite Labs., 370 F.3d at 1364.
ordered homocysteine tests performed the vitamin B12 correlation is open to question, but it is within the realm of possibility. Knowledge of the statistical generalization was widespread in the medical community as it was published in the New England Journal of Medicine, and the mental act of correlating is a reflexive act.

Legally, the conclusion that all doctors who ordered homocysteine tests were infringers is more troubling. The district court did not leave any space between the legal concept of infringement and the factual concept of appropriation of a claimed entitlement. It equated strict liability with absolute liability and assumed that all doctors who appropriated the patentee’s entitlement were direct infringers. It failed to flag the constructive-nonvolition problem that the reflexive act of correlating recited in Claim 13 is likely to entail. Both before and after the discovery of the statistical generalization linking vitamin B12 and homocysteine that underlies Claim 13, doctors could order homocysteine tests and put them to several different uses. Laboratory Corp. therefore may involve some doctors who perform the method of Claim 13 in a constructively nonvolitional manner. In order to avoid or reduce the benefit obtained from the patented, vitamin-B12-related act of thinking, some doctors may have to abandon a valued privilege that they enjoy in PW1, namely the performance of the homocysteine test for some other purpose. The task of identifying the subset of the appropriating doctors who acted in a constructively nonvolitional fashion is taken up in the following Section.

178. The existence of a constructive-nonvolition exception to patent infringement presents a legal question. Whether a particular doctor appropriated the entitlement in a constructively nonvolitional fashion presents an issue of fact.
179. See supra notes 103-05 and accompanying text.
180. If the laboratories that perform homocysteine tests and that are potentially secondarily liable pay licenses under the ‘658 patent, no doctors will ever be required to avoid performing a homocysteine test to avoid infringement. The uniform payment of royalties on all homocysteine tests, however, leads to the unacceptable result that the constructively nonvolitional appropriators of the claimed method pay a royalty in order to practice the PW1 art. Constructive nonvolition should lead to a verdict of noninfringement, not merely to an award of monetary rather than injunctive relief.
181. The district court’s opinion is complicated by the relationship between its holding on damages (all doctors who ordered the homocysteine test infringed Claim 13) and its holding on contributory infringement that was not reviewed by the Federal Circuit. The jury verdict holding LabCorp liable for contributory infringement necessarily entails a finding that there were no substantially noninfringing uses for the homocysteine test after the issuance of the ‘658 patent. See supra note 160. One interpretation of this finding is that, as a matter of fact, doctors had no substantial use for homocysteine tests other than diagnosing vitamin B12 deficiencies. This first interpretation leads to the “simplifying assumption” discussed in infra Part IV.D.2.a.
In the lower courts, *Laboratory Corp.* looked like a run-of-the-mill patent case that centered on questions of claim construction, infringement, and damages. When the Supreme Court accepted certiorari, however, it actively reframed *Laboratory Corp.* and turned it into a case about patentable subject matter under section 101. Neither the proceedings below nor the petitioner’s question on certiorari expressly mentioned section 101, but the Court requested a brief from the Solicitor General on the following question: “Is [Claim 13] invalid because one cannot patent ‘laws of nature, natural phenomena, and abstract ideas’?” The Solicitor General opined that the Court should deny certiorari because the record below was insufficiently developed and the case was not “an appropriate vehicle for resolving the Court’s question.” The Court ignored this advice and granted the writ. After the parties and numerous amicus addressed the “law of nature” or “natural phenomenon” question, however, the Court’s fervor to address the section 101 question subsided. Two and a half months after oral argument, the Court reversed course and dismissed the writ as improvidently granted. Justice Stephen Breyer dissented from the dismissal of the writ, arguing that the Court should have held that Claim 13 recites unpatentable subject matter.

Some issues in *Laboratory Corp.* must have been intuitively troublesome to the Court (or it would not have reached out to grant certiorari against the advice of the Solicitor General), yet the Court never gained any analytical traction on framing or resolving those

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Here, there are no substantial noninfringing uses because all doctors who ordered the test wanted to diagnose vitamin B12 deficiencies. No doctors wanted to do anything else with the homocysteine test. Another interpretation of the jury’s implicit finding of a lack of a substantial noninfringing use, however, is that the doctors valued the homocysteine tests for uses other than the diagnosis of a vitamin B12 deficiency, but that the doctors were unable to engage in those non-vitamin-B12-related uses without also engaging in the vitamin-B12-related use and infringing Claim 13 (if strict liability is equated with absolute liability). This second assumption leads to the “complicated reality” discussed in *Jmffa* Part IV.D.2.b. This Article considers the second assumption to be reality because of the evidence in the record suggesting that doctors ordered homocysteine tests to assess patients’ cardiovascular health.


186. *Id.* at 2921–29 (Breyer, J., dissenting).
issues (or it would not have dismissed the case). One theory to explain the Court's oscillation between passive and aggressive approaches is that constructive nonvolition was the troublesome yet unidentified issue. Breyer was in part bothered by the notion that "any competent doctor reviewing [the homocysteine] test results . . . automatically correlate[s] those results with the presence or absence of a vitamin deficiency." At the very end of the proceedings, the problem of constructive nonvolition that is magnified in claims to reflexive acts of thinking could at last be seen lurking just below the surface.

2. TWO-STEP ANALYSIS

The lower courts' error in Laboratory Corp. is most clearly presented through a two-step analysis. The first step presumes that homocysteine tests are valuable only for diagnosing vitamin B12 deficiencies and rare genetic disorders. Under this simplifying assumption, the courts may have come to the proper outcome despite the fact that constructive nonvolition was never expressly raised. The second step adds into the mix the doctors who use homocysteine tests to assess a patient's vascular health. Many of these doctors are constructively nonvolitional appropriators, and the courts erroneously concluded that they were direct infringers. This second step also illustrates the factual difficulty of identifying constructively nonvolitional appropriators.

a. Simplifying Assumption

If homocysteine tests are presumed to be valuable only for diagnosing rare genetic disorders and vitamin B12 deficiencies, the

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187. The retirement of Justice Sandra Day O'Connor after the court accepted certiorari may also have influenced the Court's reversal.
188. The propertization of thought in general may also have been part of the troublesome issue. Not only did Breyer list "mental processes" as a category of unpatentable subject matter, id. at 2923 (Breyer, J., dissenting) (quoting Gottschalk v. Benson, 409 U.S. 63, 67 (1972)), but he also noted that Metabolite "cannot avoid the fact that the [claimed] process is no more than an instruction to read some numbers in light of medical knowledge." Id. at 2928.
189. Id. at 2925 (emphasis added); see also id. at 2924.
191. Cf. supra note 104 and accompanying text.
192. Cf. supra note 105 and accompanying text.
outcome in Laboratory Corp. was at least arguably the correct one. In terms of the XYZ model discussed above, the homocysteine test, good X, is a polyvalent data-gathering step. It can be used in conjunction with the patentee’s inventive good Y, the vitamin B12 correlation. It can also be used in conjunction with good Z, the genetic-disease correlation that the patentee did not invent and that is represented in PW1 (and the prior art). If the courts had held strictly liable any doctor who valued the homocysteine test only in conjunction with the genetic-disease correlation, Claim 13 would have been both economically and constitutionally overbroad. To redress the overbreadth issue, the courts must exempt from liability all doctors who order the homocysteine test as a means of diagnosing rare genetic disorders and yet reflexively perform the correlating step of Claim 13. These doctors are constructively nonvolitional appropriators. They merely desire to practice a valued PW1 privilege, and they cannot reduce the benefit that they receive from the patented act of thinking about the vitamin B12 correlation without abandoning that privilege.

Whether any of these doctors who sought to diagnose genetic diseases were actually held strictly liable as a factual matter, however, is difficult to determine. The district court concluded that all doctors who ordered homocysteine tests from LabCorp were direct infringers of Claim 13, and it is factually possible that the genetic disease is sufficiently rare that no doctors who ordered homocysteine tests from LabCorp intended to diagnose it. Even if a handful of doctors did order the homocysteine test to diagnose the genetic disease, the overbreadth is slight.

Interestingly, Metabolite itself took a position before the Federal Circuit that supported a constructive-nonvolition exemption for the doctors who sought to diagnose the genetic disease. Metabolite argued that doctors who ordered homocysteine tests to diagnose the genetic defect were not infringers. Realizing the difficulty of defending the

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193. See generally supra Part IV.B (economic overbreadth) and Part IV.C (constitutional overbreadth).
194. See supra notes 176–77 and accompanying text.
195. Metabolite made this argument in the part of its brief before the Federal Circuit that sought to uphold the district court’s ruling that LabCorp was contributorily liable for the doctors’ direct infringements. Brief for Appellees at 43 & n.12, Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354 (Fed. Cir. 2004) (No. 03-1120). Only parties who sell nonstaple goods that cannot be put to a substantial noninfringing use can be held contributorily liable. 35 U.S.C. § 271(c) (2000). Metabolite conceded that the use of a homocysteine test to diagnose the rare genetic condition was a noninfringing use but argued that it was an insubstantial one. The Federal Circuit did not comment on this argument because it affirmed LabCorp’s secondary liability only on the basis of active inducement and not on the basis of
overbreadth that would otherwise result, the patentee became an advocate of constructive nonvolition as an exemption to infringement (although it certainly did not use this language). It acknowledged that the courts had to separate out the hypothetical demand curves for X+Y and X+Z and that the owner of the entitlement to the irrevocable bundle merited a supracompetitive profit based only on the latter under the reward principle.¹⁹⁶

b. Complicated Reality

Metabolite made no such constructive-nonvolition concession with respect to the doctors who ordered homocysteine tests in order to assess a patient's vascular health. There was evidence in the record indicating that a significant number of doctors ordered homocysteine tests from LabCorp for the purpose of assessing vascular health.¹⁹⁷ Yet both the district court and the Federal Circuit treated all doctors who ordered homocysteine tests as direct infringers. Unlike the question that remains open with respect to tests for the genetic disease, there is no question that, as a matter of fact, some doctors did order the homocysteine test to diagnose their patients' vascular health.

The economic and constitutional overbreadth that results from holding all doctors who assess cardiovascular health liable as infringers of Claim 13 is again evident from the XYZ model of irrevocable bundles. The homocysteine test is still good X, and the inventive vitamin B₁₂ correlation remains good Y. To accommodate another use for the homocysteine test, the genetic-disorder use becomes good Z₁ and the vascular-health use becomes good Z₂. Good Z₂ (the vascular-disease-homocysteine correlation) was known in some form prior to the invention of good Y (the vitamin B₁₂–homocysteine correlation),¹⁹⁸ so the use of X+Z₂ is both a prior art and a PW₁ privilege. To avoid both contributory liability. Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354, 1365 (Fed. Cir. 2004).

¹⁹⁶ It is possible, but unlikely, that Metabolite was arguing that the doctors who desired to diagnose rare genetic diseases did not infringe because they did not know about the vitamin B₁₂ correlation.

¹⁹⁷ See supra note 105.

¹⁹⁸ The correlation between homocysteine and vascular health was initially proposed as far back as 1969. Brief for Appellees at 12, Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354 (Fed. Cir. 2004) (No. 03-1120). It did not gain widespread acceptance as a diagnostic tool in the medical community, however, until after the issuance of the '658 patent. Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 126 S. Ct. 2921, 2923 (2006) (Breyer, J., dissenting). But see infra note 204 and accompanying text (considering the possibility that the contemporary act of correlating homocysteine and cardiovascular health is categorically different from the act of correlating that could be performed in 1969).
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constitutional and economic overbreadth, a doctor should not be required to give up the privilege of using the XZ2 bundle merely to reduce the benefit obtained from the patented good XY. A doctor who desires the homocysteine test only as a tool to assess vascular disease is a constructively nonvolitional appropriator.

Metabolite argued that the genetic-disease and vascular-health correlations were different in a way that makes a difference. According to Metabolite, doctors who ordered homocysteine tests for the purpose of assessing a patient's vascular health were direct infringers because the method of assessing vascular disease and the claimed method of diagnosing vitamin B12 deficiencies are in fact one and the same method. In a sense, Metabolite is correct. The parties' briefs suggest that the vitamin B12 and vascular-health correlations are transitive: vitamin B12 deficiencies correlate to elevated homocysteine levels which in turn correlate to problems for a patient's vascular health. As Metabolite described the situation, a diagnosis of a vitamin B12 deficiency identifies a cause of the elevated homocysteine level and an assessment of vascular health identifies an effect. The interdependence of these two correlations, however, cannot justify holding a doctor who seeks to assess a patient's cardiovascular health liable for infringement of Claim 13. If anything, it highlights in even greater contrast the need for a constructive-nonvolition exemption from infringement. The ability to correlate an elevated homocysteine level to vascular disease was in the prior art of the '658 patent. In order to reduce the benefit obtained from performing the method recited in Claim 13, the doctor must abandon this privilege that he or she possesses and values in PW1. By discovering a new cause of a previously known effect of elevated homocysteine, Metabolite seeks a right to exclude that is broad enough to prevent the free use of the homocysteine test to detect the previously known effect.

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200. The presence of the vascular-health correlation in the prior art does not mean that Claim 13 should have been invalid for lack of novelty. The interdependence of the correlations became known only after the invention was disclosed in the '658 patent.
201. But see infra note 207 and accompanying text (discussing a doctor's ability to reduce the benefit obtained from the patent entitlement by altering post-thinking conduct).
202. Metabolite characterized the post-'658 invention situation as the "discovery of a new manifestation (vascular disease) of an old problem (B12 deficiency)." Brief for Appellees at 45, Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354 (Fed. Cir. 2004) (No. 03-1120), but Metabolite's own characterization of the record suggests that it is the '658 invention itself that is more
Laboratory Corp. illustrates how courts can err if they equate strict liability with absolute liability. Doctors who use a homocysteine test only to assess a patient's vascular health reflexively appropriate the entitlement described by Claim 13, but the constructive-nonvolition exemption should apply. Otherwise, the patentee's reward violates the reward principle, and the reduction in the public's rights violates the baseline principle. 203

Laboratory Corp. also allows the patent community to take stock of exactly how difficult it can be to distinguish infringers of reflexive-thought-propertizing claims from constructively nonvolitional appropriators. The distinction entails at least three questions.

First, courts must identify a prior art comprised of acts of thinking and determine whether an allegedly infringing act of thinking that occurs today is part of the prior art. 204 The comparison of contemporary technology to the prior art is a commonplace patent law procedure, but it is more difficult when acts of thinking are the technology at issue. Acts of thinking do not leave the same externalized trail to document their existence. Is the vascular-health correlation employed today the same as the vascular-health correlation that was known in 1969, or is it different in some way that is significant? The relatively poor documentation of acts of thinking and society's inability to specify their precise contents makes this question a difficult one. Contemporary doctors may well understand the correlation between homocysteine and vascular health in much greater detail than their 1969 counterparts did. For example, using a factually fabricated example, they may know accurately described as the discovery of a new cause (B12 deficiency) for an old problem (vascular disease) of elevated homocysteine.

203. If doctors who appropriate the Claim 13 entitlement to assess cardiovascular health are not direct infringers, then the district court also erred in making LabCorp contributorily liable. The homocysteine test has a substantial noninfringing use. See supra note 160 (explaining that only sellers of nonstaple goods without substantial noninfringing uses can be contributory infringers). However, the Federal Circuit may not have erred when it affirmed the district court's conclusion that LabCorp was secondarily liable on the basis of active inducement. See Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354, 1365 (Fed. Cir. 2004). (However, the damages award should not have included the homocysteine tests ordered by the constructively nonvolitional appropriators.) If LabCorp's promotional material emphasized the diagnosis of a vitamin B12 deficiency rather than the assessment of vascular health, then it may have aided and abetted the infringing doctors. Because the vitamin B12 and vascular-health correlations are so closely intertwined, however, making a clean distinction between promotional materials that promote one rather than the other would be a difficult task.

204. Examiners and judges also face a similar problem when determining the novelty and nonobviousness of a thought-propertizing claim. They must determine whether the claimed act of thinking is in the prior art or is obvious in light of the prior art.
more precisely today that an elevated homocysteine level indicates a seventy percent chance of poor vascular health. Do these refinements in the vascular-health correlation mean that the correlation is different from and nonobvious in light of the correlation that exists in the prior art?

Second, assuming that the allegedly infringing contemporary act of thinking is not represented in the prior art, a court must determine whether it nonetheless exists in PW1. Here, a court must engage a complex counterfactual hypothetical: What do we know in PW1—the possible world that is closest to the actual world yet in which the vitamin B12 correlation is never discovered? In PW1, do we eventually come to know the more precise refinement of the vascular-health correlation that exists in the actual world today? If the answer is yes, then a doctor who uses a homocysteine test to diagnose a patient's vascular health is a constructively nonvolitional appropriator of Claim 13 even if the contemporary vascular-health correlation is not in the prior art.

Third, assuming that the contemporary vascular-health correlation is represented in PW1, a court must determine whether a doctor who reflexively performs the act of correlating recited in Claim 13 could have reduced the benefit obtained from the patented technology without abandoning a valued PW1 privilege. This question in turn needs to be divided into two sub questions that address roughly the defendant's state of mind before the claimed act of thinking and the defendant's conduct after it. First, does the doctor value the PW1 privilege of diagnosing vascular disease at the time he or she orders the homocysteine test? This is a question of ex ante intent in the sense of motivation for willingness to pay. If a doctor, such as a vitamin specialist, is indifferent to a patient's vascular health when he or she orders the homocysteine test, the doctor an infringer. Second, even if a doctor valued a PW1 privilege and desired to obtain information about a patient's vascular health at the time the homocysteine test was ordered, the doctor's conduct after the test can transform the constructively nonvolitional doctor into an infringer. If a defendant takes affirmative steps to benefit from the patent entitlement that are not necessary to enjoy PW1 privileges that he or she valued, the defendant is an infringer. If a doctor orders a homocysteine test with the sole purpose of assessing a patient's vascular health but then delivers a

205. Cf. supra note 34 and accompanying text (discussing the difficulty of identifying the full contents of PW1 with certainty).

206. If a doctor has mixed motives, then the constructive-nonvolition analysis may differ depending upon whether economic or constitutional overbreadth is at issue. See supra notes 165, 170.
diagnosis of a vitamin B12 deficiency to a patient after viewing the test results, the doctor infringes Claim 13. By remaining silent, the doctor can reduce the benefit obtained from the patented act of correlating without facing any cost other than the legitimate opportunity cost of practicing the PW1 art in the actual world.

V. CONCLUSION

This Article makes the same argument on two nested levels of generality. At the more general level, it argues that courts should not equate strict liability with absolute liability in patent cases and that constructive nonvolition should provide an exemption to patent infringement. It pulls together the previously unconnected cases of *SmithKline Beecham v. Apotex* and *Monsanto v. Schmeiser* as well as a number of hypotheticals to explain and illustrate the concept. Constructive nonvolition identifies an unusual type of violation of the reward and baseline principles that is not visible on the radar screens of courts using only the traditional invalidity doctrines to search for overbroad claims. It focuses on the unjustifiable restriction of a defendant’s options and argues that the absence of sufficient liberty or choice in those options can justify a defendant’s appropriation of an otherwise valid patent entitlement.

At the more specific level, this Article brings constructive nonvolition to bear on a class of claims that raise the constructive-nonvolition issue on a scale previously unknown in patent law: claims that propertize reflexive thought. It initially picks the easy fight. Claims to freestanding, reflexive acts of thinking create entitlements to others’ involuntary conduct, and the need for a constructive-nonvolition exemption to infringement in cases involving these claims is self-evident. It then examines claims that describe entitlements to the performance of a deliberate data-gathering step that has been irrevocably bundled with an inventive, reflexive act of thinking. It argues that claims to irrevocable bundles, too, will frequently grant patentees rights that are overbroad unless courts recognize a constructive-nonvolition exemption from infringement. It illustrates that the overbreadth that results from imposing per se liability has both economic and constitutional dimensions, and it identifies the

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207. Similarly, if a doctor orders a homocysteine test with the intent of assessing a patient’s vascular health but then medicates a patient with vitamin B12, the doctor is an infringer unless the treatment of poor vascular health with vitamin B12 is a practice that exists in PW1 even though the correlation between homocysteine and vitamin B12 is not known.
overbreadth that resulted because the lower courts in *Laboratory Corp.* failed to address the problem of constructive nonvolition.

At both levels of generality, the body of this Article focuses on debunking the reflexive equation of strict liability and absolute liability and identifying the circumstances under which constructively nonvolitional appropriation of a patent entitlement occurs. In conclusion, it looks down the road and, assuming that the courts recognize a constructive nonvolition exemption, considers two possible implications of that recognition for thought-propertizing claims.

The first implication follows from the high cost of the constructive-nonvolition analysis. As the analysis of the doctors who performed the vascular health correlation in *Laboratory Corp.* suggests, the identification of constructively nonvolitional infringers may be a detailed, intricate, and difficult analysis. The Federal Circuit and the PTO should therefore consider implementing a per se bar on any method claim that can be routinely appropriated by the performance of an involuntary act. Case-by-case examination of a nonfrivolous, constructive-nonvolition defense may be required in any patent infringement suit because any patent entitlement may be appropriated in a constructively nonvolitional manner under exceptional circumstances. However, if the final and inventive step of a method describes a type of conduct that is routinely performed in an involuntary fashion, the likelihood of a court having to address a constructive-nonvolition defense increases by several orders of magnitude. To reduce the high cost of a case-by-case examination of constructive nonvolition, it may make sense to cut the problem off at the pass and invalidate a distinct group of claims if they entail an unusually high probability of nonfrivolous, constructive nonvolition defenses.

The second implication looks at how patent applicants will respond to judicial recognition of constructive nonvolition and highlights the relatively minor effect that even the per se bar considered above would have on the scope of patent protection. The resolution of the problem of constructive nonvolition should not be confused with a resolution of the problem posed by the propertization of thought more broadly. Some thought-propertizing claims are more purposive than reflexive, and they are largely unaffected by the exemption for constructively nonvolitional appropriation of a patent entitlement. Furthermore, many thought-propertizing claims that do recite reflexive acts of thinking may be readily altered with only a small reduction in scope to prevent routine appropriation by involuntary acts. For example, thought-

208. *See supra* Part IV.D.2.b.  
209. *See supra* Part III.B.
propertizing claims could be transformed into speech-propertizing claims. The inventors of the '658 patent could add a third and final step to Claim 13 such as "informing the patient of a vitamin B12 deficiency." The inclusion of a token, post-thought deliberate act of expression means that a defendant's involuntary performance of the reflexive act of thinking does not appropriate the claimed entitlement.

Thus, even if the problem of constructive nonvolition is recognized and solved—through either the implementation of a constructive-nonvolition exemption to infringement or the invalidation of thought-propertizing claims that are likely to be performed involuntarily on a regular basis—a patentee may still internalize the benefit that the public receives from thinking about the inventive information disclosed in the patent specification. For better or worse, redress of the overbreadth caused by the reflexive nature of some acts of thinking need not be anything other than a speed bump on the road to the widespread propertization of thought.

210. See supra note 207 and accompanying text (discussing the role of post-thinking conduct in the identification of constructive nonvolition).

211. The inclusion of any post-thinking, deliberate step is insufficient. The step must be limited to expressing or acting on the conclusion reached through the act of thinking. If a third step such as "walking out of the office" were added to the Laboratory Corp. claim, it would not eliminate the constructive-nonvolition problem.