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Intuitive Patenting

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INTUITIVE PATENTING

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Patentable subject matter determinations are ultimately based not on judicial doctrines, tests, statutes, or even on the economic rationales underlying the patent system; rather, the fundamental touchstone for what qualifies as patentable technology is simply intuition. Specifically, despite the Federal Circuit's rejection of "technological arts" as a linguistically bright-line test, patentable subject matter decisions inevitably devolve into what is, at base, an intuitive sense of what constitutes technology of the type protectable under the patent system.

I. INTRODUCTION

Patentable subject matter is a difficult issue—just ask the Supreme Court. In the last four years, the Court has agreed to hear four separate cases addressing what exactly qualifies as patentable technology. The Court's decisions thus far in *Bilski v. Kappos*,[1] *Mayo Collaborative Services v. Prometheus Laboratories*,[2]

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1. 130 S. Ct. 3218 (2010).
2. 132 S. Ct. 1289 (2012).

Ass'n for Molecular Pathology v. Myriad Genetics, Inc.,[3] and *Alice Corp. Pty., Ltd. v. CLS Bank International*[4] have provided disappointingly little instruction. For an area of law designed to promote technological progress, one would think that the patent system would be able to devise an equally scientific method for dealing with its subject matter. Nonetheless, such precision seems impossible, leaving the boundaries of patentable subject matter insolubly murky.[5]

This Article explains that this murkiness stems from the unavoidably intuitionist nature of patentable subject matter distinctions. Several critics have noted that the more notorious patentable subject matter decisions seem to be based on nothing more than intuition.[6] However, patentable subject matter's reliance on intuitionism is much more widespread than the critics realize—*all* patentable subject matter determinations are based on intuition—there are no other, more objective bases on which to make these determinations.

The failure to identify objective criteria for patentable subject matter is not for lack of effort. The case law on patentable subject matter discusses at length a slew of doctrines, policy-based rationales, precedents, and statutory language, but none of these can explain how patentable subject matter determinations are actually made or, more importantly, why. The only thing known for certain about patentable subject matter is the Constitution's objective that the patent system "promote the Progress . . . in useful Arts,"[7] or what modern courts refer to as "technology."[8] And although the Federal Circuit has rejected technological arts as a linguistically bright-line test,[9] the court implicitly recognize that, given the Constitution's mandate, all patentable subject matter must be technological by some measure. With the utter lack of useable objective criteria for defining patentable subject matter, otherwise, however, the courts are left with nothing other than a their own best guesses—that is, intuition—to determine what is or is not technology of the type protectable under the patent system.

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3. 133 S. Ct. 2107 (2013).

4. 134 S. Ct. 2347 (2014).

5. John F. Duffy, *Rules and Standards on the Forefront of Patentability*, 51 WM. & MARY L. REV. 609, 616 (2009).

6. *See* Kevin Emerson Collins, *Bilski and the Ambiguity of "An Unpatentable Abstract Idea"*, 15 LEWIS & CLARK L. REV. 37, 39 (2011) [hereinafter Collins, Bilski] (citing Jacobellis v. Ohio, 378 U.S. 184, 197 (1964) (Stewart, J., concurring)); Kevin Emerson Collins, *Getting Into The "Spirit" of Innovative Things: Looking to Complementary and Substitute Properties to Shape Patent Protection for Improvements*, 26 BERKELEY TECH. L.J. 1217, 1236 (2011) [hereinafter Collins, *Spirit*]; Duffy, *supra* note 5, at 619–20; Rebecca S. Eisenberg, *Wisdom of the Ages or Dead-Hand Control? Patentable Subject Matter for Diagnostic Methods After* In re Bilski, 3 CASE W. RESERVE J.L. TECH. & INTERNET 1, 44–45 (2012) (noting that "judicial exclusions of patentable subject matter depend on the intuition of jurists").

7. U.S. CONST. art. I, § 8, cl. 8.

8. *See generally* Robert I. Coulter, *The Field of the Statutory Useful Arts*, 34 J. PAT. OFF. SOC'Y 417, 498 (1952) ("Probably the best word in common usage today that expresses this idea is *'technology.' The technological arts are the 'useful arts'*") (emphasis in original).

9. *See infra* text accompanying notes 18–23.

This reliance on intuition was inevitable. Patent law is a one-size-fits-all system that is designed not only to incentivize the creation of new and unique inventions, but also to do so across a wide array of technologies. Creating uniform patentable subject matter criteria to address such a wide diversity of technology is difficult enough. Creating criteria that would optimize the balance between incentivizing investments in technology without unduly hindering future development is perhaps impossible, even improving the doctrine seems to be an insurmountable task. Far from being the cause of this confusion, the patent system's reliance on intuition is the inescapable result of this constant novelty and unpredictability of technological development. While this kind of resort to intuitionism may seem suspect, when there is no "right" answer to an unfalsifiable question, intuition is no worse than any other answer.[10] Patentable subject matter is in good company this way, moreover. Intuition is thought to drive subject matter decisions in copyright and trademark law as well.[11]

The explanation of patentable subject matter's intuitionist nature proceeds as follows. Part I introduces the problems of how patentable subject matter has been defined thus far, and Part II then discusses in detail how the various rationales and tests for patentable subject matter fail to explain how patentable subject matter decisions are actually made. Identifying patentable technology is instead a judgment call based on intuition. Part III then discusses the implications of this reliance on intuitionism, explaining not only its inevitability but also how it comports with other aspects of patent law and intellectual property law more broadly.

II. THE PROBLEM OF PATENTABLE SUBJECT MATTER AND § 101

Generally stated, patentable subject matter restrictions are a threshold limitation over what kind of works a patentee can have exclusive rights.[12] Patents rights are in many ways property-like entitlements that putatively serve at least two of the same major functions as property rights. First, patents are designed to incentivize investments in research and development (R&D) by granting patentees the property-like right to exclude all others from making, using, selling, or offering to sell their inventions for a limited period of time.[13] Second, patents are designed to give potential infringers notice of the patentees' exclusive rights and to delineate the boundaries of those rights.[14]

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10. R. George Wright, *The Role of Intuition in Judicial Decisionmaking*, 42 HOUS. L. REV. 1381, 1394–95 (2013).

11. Dennis S. Karjala, *Distinguishing Patent and Copyright Subject Matter*, 35 CONN. L. REV. 439, 476 (2003).

12. *See* Bilski v. Kappos, 130 S. Ct. 3218, 3225 (2010) (quoting Patent Act, 35 U.S.C. § 101 (2012)); David S. Olson, *Taking the Utilitarian Basis for Patent Law Seriously: The Case for Restricting Patentable Subject Matter*, 82 TEMP. L. REV. 181, 184 (2009).

13. Olson, *supra* note 12, at 192.

14. *See* Kenneth W. Dam, *The Economic Underpinnings of Patent Law*, 23 J. LEGAL STUD. 247, 254 (1994) (citing 35 U.S.C. §§ 102–103).

Patents also create problems, however. Patents create potentially monopolistic rights that can enable patent holders to raise prices to supracompetitive levels while creating deadweight losses.[15] Further, although a patent immediately releases information about an invention to the public, a patent also delays the invention's entry into the public domain, thereby hindering its availability as a foundation for further invention.[16] Moreover, as explained below, patents are not the only form of intellectual property or property-like rights that can protect creative endeavors, and perhaps some creative endeavors just should not be deemed to be property at all. Thus, even though patent rights expire after twenty years from the date of application, the patent system must still carefully cabin what inventions may be the subject of a patent's technological, and potentially economic, monopoly.[17]

The gateway restriction on what can be the subject of patent exclusivity is patentable subject matter. All definitions of patentable subject matter must start with Article I, Section 8 of the Constitution, which grants Congress the authority "[t]o promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries[.]"[18] Although modern usage would suggest that the patent system covers "Science" and that copyright covers "useful Arts," the useful Arts actually refers to what has become the subject of the patent system.[19] The term useful Arts is synonymous with what modern English refers to as technology and the technical arts.[20]

What qualifies as "useful Art," as opposed to "Science" or some *tertium quid*, however, is unclear. What is technology? As the Federal Circuit[21] noted in its recent *In re Bilski* decision, the words technical and technology are

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15. Olson, *supra* note 12, at 193 (citing Julie E. Cohen & Mark A. Lemley, *Patent Scope and Innovation in the Software Industry*, 89 CAL. L. REV. 1, 50 (2001)).

16. *See* Olson, *supra* note 12, at 196–97.

17. Olson, *supra* note 12, at 192–93 (citing 35 U.S.C. § 154(a)(2); Cohen & Lemley, *supra* note 15, at 50).

18. U.S. CONST. art. I, § 8, cl. 8.

19. *See* Coulter, *supra* note 8; Karl B. Lutz, *Patents and Science: A Clarification of the Patent Clause of the U.S. Constitution*, 18 GEO. WASH. L. REV. 50 (1949–50); Edward C. Walterscheid, *To Promote the Progress of Science and Useful Arts: The Background and Origin of the Intellectual Property Clause of the United States Constitution*, 2 J. INTELL. PROP. L. 1, 52 (1994) (citing Arthur H. Seidel, *The Constitution and a Standard of Patentability*, 48 J. PAT. OFF. SOC'Y 5, 10 (1966)).

20. *See* Bilski v. Kappos, 130 S. Ct. 3218, 3224 (2010) (Stevens, J., concurring); *In re* Comiskey, 554 F.3d 967, 977 (Fed. Cir. 2009) (quoting Paulik v. Rizkalla, 760 F.2d 1270, 1276 (Fed. Cir. 1985) (en banc)); *In re* Bergy, 596 F.2d 952, 959 (C.C.P.A. 1979) (quoting *In re* Musgrave, 431 F.2d 882, 893 (C.C.P.A. 1970); *see also* Alan L. Durham, *"Useful Arts" in the Information Age*, 1999 BYU L. REV. 1419, 1437–44; Lutz, *supra* note 19, at 54.

21. Founded in 1982 as the successor to the Court of Claims and Patent Appeals, the Court of Appeals for the Federal Circuit is the appellate court assigned exclusive jurisdiction over cases "relating to patents." 28 U.S.C. § 1295 (2012).

ambiguous terms that depend on context,[22] as technology is constantly changing.[23] The Federal Circuit has therefore rejected technological arts as a bright-line, linguistic test for patentable subject matter.[24] Both the Patent Act and judicial precedent have attempted to clarify patentable subject matter by setting forth statutory categories of included subject matter and common law categories of excluded subject matter. Unfortunately, these categories have also proven to be rather vague.[25]

Section 101 of the Patent Act, for example, states that patents may cover "any new and useful process, machine, manufacture, or composition of matter."[26] At first glance the statute seems plain enough, but proves difficult to apply in practice. Part of the problem, of course, is technological change. The language of Section 101 dates back to the Patent Act of 1793, but because technology has obviously changed a great deal since then the courts have interpreted Section 101's terms liberally to provide the necessary flexibility to new technologies.[27]

The very liberality that allows such flexibility also creates problems, however. Just as reading Section 101 too rigidly would render the statute obsolete, reading Section 101 too broadly would render it meaningless. How to draw the line between adapting Section 101 to future technologies while at the same time remaining true to its limitations poses obvious challenges. The few definitions the Patent Act provides are so self-referential as to be almost meaningless.[28] Even Federal Circuit judges cannot agree amongst themselves as to how best to define each category.[29] Instead, the courts typically avoid defining the categories, or even into which category a claimed invention might fall, focusing rather on whether the invention falls into one of the categories of unpatentable subject matter.[30]

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22. 545 F.3d 943, 960 (2008) (en banc). For convenience, however, the following discussion refers to "patentable technology" as synonymous with "useful Arts."

23. *In re* Bilski, 545 F.3d at 960; *Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility*, OFFICIAL GAZETTE FOR PAT. 1, 44 (Oct. 26, 2005), http://www.uspto.gov/web/offices/pac/dapp/opla/preognotice/guidelines101_20051026.pdf.

24. *In re* Bilski, 545 F.3d at 960; *see also* Diamond v. Diehr, 450 U.S. 175, 200–01 (1981) (Stevens, J., dissenting) (citing *In re* Musgrave, 431 F.2d at 893; *In re* Benson, 441 F.2d 682, 688 (C.C.P.A. 1971); *In re* Foster, 438 F.2d 1011, 1014–15 (C.C.P.A. 1971)).

25. *Diamond*, 450 U.S. at 219 (Stevens, J., dissenting).

26. Patent Act, 35 U.S.C. § 101 (2012).

27. Duffy, *supra* note 5, at 620 (quoting 35 U.S.C. § 101 (2012); 35 U.S.C. § 100(b) (2012); Act of Apr. 10, 1790, 1 Stat. 109, 110; 1793, 1 Stat. 318, 319).

28. *See* 35 U.S.C. § 100(b) (2012) (defining "process" as a "process, art, or method"); *see also* Parker v. Flook, 437 U.S. 584, 588 n.9 (1978) (noting ambiguity of Section 101's categories).

29. *Compare, e.g.*, *In re* Nuijten, 500 F.3d 1346, 1356–57 (Fed. Cir. 2007) (holding that "manufactures" cannot be transitory), *with id.* at 1358 (Lynn, J., dissenting) (arguing that "manufactures" are not so limited).

30. *See In re* Nuijten, 500 F.3d at 1362 (Linn, J., dissenting); Michael Risch, *Everything is Patentable*, 75 TENN. L. REV. 591, 637–38 (2007) (citing Am. Fruit Growers, Inc. v. Brogdex Co., 283 U.S. 1, 11–12 (1931).

In fact, perhaps because of the difficulties of defining Section 101's included categories, patentable subject matter seems to be defined primarily by what it does not include. The courts have developed three judicially defined exceptions to patentable subject matter, generally referred to as "laws of nature," "phenomena of nature," and "abstract ideas."[31] The common law categories of unpatentable subject matter are no less ambiguous than the statutory categories of patentable subject matter,[32] however, and suffer from much the same potential for overbreadth. Just as the statutory categories of included subject matter could be construed to cover that which is clearly unpatentable, the common law categories of excluded subject matter could be construed to cover that which is clearly patentable.[33]

The patent system has had a particularly difficult time differentiating patentable processes under Section 101 from unpatentable laws of nature and abstract ideas.[34] Of all the categories of patentable subject matter, processes are perhaps the most difficult to parse.[35] Although processes often involve the use of manufactures, machines, and compositions of matter, processes differ from those other three categories of patentable subject matter because processes are

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31. Some courts use the terms *products of nature* or *physical phenomena* to refer to *phenomena of nature*, as used in this Article. Courts also often refer to "mental processes" or "mental steps" and "mathematical algorithms" as sub-types of excluded subject matter. The discussion here, however, follows the Supreme Court's description of phenomena in nature, laws of nature, and abstract ideas as the three main categories of exclusion. *See* Alice Corp. Pty v. CLS Bank Int'l, 134 S. Ct. 2347, 2354 (2014) (quoting Ass'n for Molecular Pathology v. Myriad Genetics, Inc., 133 S. Ct. 2107, 2116 (2013)); Bilski v. Kappos, 130 S. Ct. 3218, 3225 (2010) (quoting Diamond v. Chakrabarty, 447 U.S. 303, 309 (1980)). These common-law exceptions reputedly date back at least 150 years. *Bilski*, 130 S. Ct. at 3225.

32. *See In re* Warmerdam, 33 F.3d 1354, 1358–59 (Fed. Cir. 1994) (noting the patent system "ha[s] sought to find more precise definitions for the things excluded, but without complete success").

33. *See, e.g.*, Diamond v. Diehr, 450 U.S. 175, 219 (1981) (Stevens, J., dissenting) (noting that almost any process could be described as an unpatentable algorithm or law of nature); Bancorp Servs. v. Sun Life Assurance, 687 F.3d 1266, 1277 (2012) (noting that even machines are sometimes equivalent to abstract ideas); *In re* Freeman, 573 F.2d 1237, 1245 (1978) (noting that all processes can be characterized as "algorithms"); Donald S. Chisum, *The Patentability of Algorithms*, 47 U. PITT. L. REV. 959, 974, 977 (1986) (similar).

34. *See, e.g.*, Tilghman v. Proctor, 102 U.S. 707, 728 (1880) (noting the line between a patentable "process" and an unpatentable "principle" is not always clear); *see also* Duffy, *supra* note 5, at 620 (quoting 35 U.S.C. § 101 (2012); 35 U.S.C. § 100(b); Act of Apr. 10, 1 Stat. 109, 110; Act of Feb. 21, 1793, 1 Stat. 318, 319); Robert A. Kreiss, *Patent Protection for Computer Programs and Mathematical Algorithms: The Constitutional Limitations for Patentable Subject Matter*, 29 N.M. L. REV. 31, 33 (1999).

35. *See, e.g.*, Parker v. Flook, 437 U.S. 584, 591–92 (1978) (citing Mackay Radio & Tel. Co. v. Radio Corp. of Am., 306 U.S. 86 (1939); Funk Bros. Seed Co. v. Kalo Co., 333 U.S. 127 (1948); O'Reilly v. Morse, 56 U.S. 62, 112–21 (1853)) (quoting Neilson v. Harford, Web. Pat. Cases 295, 371 (1844)) (explaining that it is often "very difficult" to distinguish patentable processes from "a patent for a principle").

states of activity, not corporeal or structural entities.[36] As the courts define them, processes are "sequence[s] of actions" or "operation[s] or series of steps leading to a useful result."[37] The Supreme Court has noted that the term process as used in Section 101 does not cover all processes that would fall within its plain meaning, however.[38] Merely to state that a process is a series of steps or actions does not tell us anything about what kind of steps or actions qualify as a process. As the Supreme Court stated in *Parker v. Flook*, "[t]he line between a patentable 'process' and an unpatentable 'principle' is not always clear. Both are '[conceptions] of the mind, seen only by [their] effects when being executed or performed.'"[39]

Similarly, the term abstract idea could be defined broadly enough to cover all patentable inventions.[40] As the courts have long reminded us, patents protect the abstract inventive concept behind an invention, as opposed to the concrete embodiments thereof.[41] What then differentiates an abstract but patentable inventive concept from an abstract but unpatentable idea? Further, what differentiates an unpatentable algorithm from a patentable process? The patent system has long excluded algorithms as unpatentable laws of nature or abstract ideas.[42] The definition of algorithm does not refer only to mathematical algorithms, however, but also to any set of rules or steps for solving a problem.[43] Algorithms thus could be construed to cover both unpatentable and patentable

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36. *Flook*, 437 U.S. at 588 n.9, 589 (citing Gottschalk v. Benson, 409 U.S. 63, 64 (1972)); *see also* 1 DONALD CHISUM, CHISUM ON PATENTS § 1.03, at 1–109 (Matthew Bender ed., 2014) (quoting various cases identifying processes as states of action).

37. 1 CHISUM, *supra* note 36, § 1.03, at 1-109 n.2.

38. *See, e.g.*, *Flook*, 437 U.S. at 588–89 (citing 409 U.S. 63, 64 (1972)) (discussing *Gottschalk v. Benson*'s holding that "process" cannot be defined based on a purely literal reading of section 101).

39. 437 U.S. at 589 (quoting Tilghman v. Proctor, 102 U.S. 707, 728 (1880)).

40. Donald S. Chisum, *Weeds and Seeds in the Supreme Court's Business Method Patents Decision: New Directions for Regulating Patent Scope*, 15 LEWIS & CLARK L. REV. 11, 14 (2011); *see also* Eisenberg, *supra* note 6, at 46 (observing that the abstract idea category is too vague and uncertain to serve as much of a gatekeeper).

41. *See, e.g.*, Duffy, *supra* note 5, at 642 (quoting 1 WILLIAM C. ROBINSON, THE LAW OF PATENTS FOR USEFUL INVENTIONS § 134, at 190–92 (1890)) ("No proposition has been more frequently or positively stated by the courts than that a principle is not a patentable invention, and yet with almost equal positiveness and frequency they have declared that the subject-matter covered by a patent is the principle of the invention."); Alan L. Durham, *The Paradox of "Abstract Ideas,"* 2011 UTAH L. REV. 797, 843–44 (2011); Emily Michiko Morris, *Res or Rules Patents and the (Uncertain) Rules of the Game*, 18 MICH. TELECOMM. & TECH. L. REV. 481, 498 (2012).

42. *E.g.*, Mayo Collaborative Servs. v. Prometheus Labs., 132 S. Ct. 1289, 1299–1300 (2012) (quoting Parker v. Flook, 437 U.S. 584, 586, 598 (1978)) (citing Diamond v. Diehr, 450 U.S. 175, 192 (1981)) (referring to an algorithm as a "law of nature"); Gottschalk v. Benson, 409 U.S. 63, 71–72 (1972) (comparing mathematical algorithm at issue there with laws of nature); *In re* Warmerdam, 33 F.3d 1354, 1360 (Fed. Cir. 1994) (stating that mathematical constructs are "the paradigmatic 'abstract idea'").

43. *In re* Freeman, 573 F.2d 1237, 1245–46 (C.C.P.A. 1978) (quoting *In re* Chatfield, 545 F.2d 152, 158 (C.C.P.A. 1976).

subject matter, including processes and even machines.[44] In fact, many inventions claimed as machines or manufactures have been rejected as unpatentable abstract ideas.[45] Given the wide and amorphous boundaries of the categories of exclusion, what distinguishes a patentable inventive concept from an unpatentable abstract idea or law of nature is unclear.

The problem with the categories of patentable and unpatentable subject matter is not just one of definition and technological change, moreover. Technologies rarely exist as discrete categories. Nothing exists as a pure process, machine manufacture, or composition of matter untainted by unpatentable elements.[46] All inventions use products of nature as their starting materials at the very least, and all inventions rely on laws of nature, abstract ideas, or both.[47] The question thus becomes one of degree: how much changed from nature and how much in addition to an abstract idea does a claimed invention need to qualify as patentable subject matter under Section 101? More importantly, how is this measured? Unfortunately, the few definitions available for Section 101's categories of included subject matter and the common law categories of excluded subject matter provide no clues.[48]

The courts have consequently tried to define patentable technology and identify patentable subject matter through other means.[49] The various statutory and common law categories, judicial doctrines and tests, and policy-derived rationales cited for patentable subject matter determinations are merely post hoc rationalizations in support of determinations apparently made by other means. The discussion below shows that what ultimately drives patentable subject matter law is nothing more than intuition—specifically, an intuitive sense of what patentable technology is and therefore what fits within the Constitution's mandate for the patent system.

In some patentable subject matter cases this reliance on intuition is blatantly clear. The Supreme Court's recent decision in *Bilski v. Kappos* is a prime

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44. *See, e.g.*, Diamond v. Diehr, 450 U.S. 175, 219 (1981) (Stevens, J., dissenting) (discussing patentability of programs and un-patentability of process); Bancorp Servs. v. Sun Life Ins. 687 F.3d 1266, 1277 (2012) ("[A] machine, system, medium, or the like may in some cases be equivalent to an [algorithm] for purposes of patent ineligibility."); *In re* Freeman, 573 F.2d at 1245–46 (C.C.P.A. 1978) (quoting *In re* Chatfield, 545 F.2d 152, 158 (C.C.P.A. 1976) (noting that every process may be characterized as an algorithm); Chisum, *supra* note 40, at 974–75 (quoting M. MACHTEY & P. YOUNG, AN INTRODUCTION TO THE GENERAL THEORY OF ALGORITHMS 1 (1978); M. AISERMAN, L. GUSEV, L. ROZONOER, I. SMIRNOVA & A. TAL', LOGIC, AUTOMATA, AND ALGORITHMS 305 (1971)) (noting broad definition of algorithms and their overlap with "processes").

45. *See* Emily Michiko Morris, *What Is Technology?*, 20 B.U. J. SCI. & TECH. L. 24, 51–55 (2014).

46. *See id.* at 45–46, 50.

47. Ass'n for Molecular Pathology v. Myriad Genetics, Inc., 133 S. Ct. 2107, 2116 (2013) (quoting Mayo Collaborative Servs., 132 S. Ct. at 1293); Merck & Co. v. Olin Mathieson Chem. Corp., 253 F.2d 156, 161–62 (4th Cir. 1958)).

48. *See In re* Warmerdam, 33 F.3d 1354, 1359 (Fed. Cir. 1994).

49. *See infra* Part III.

example.[50] In *Bilski*, the Court majority held that that Bilski's business method was an abstract idea and therefore unpatentable.[51] Despite the patent bar's hope that the Supreme Court would finally clarify how to identify an abstract idea, however, neither the majority opinion nor the concurring opinions offered any explanation for what constitutes an abstract idea.[52] Search *Bilski* high and low for a neat delineation of what patentable subject matter is and all one will find is the various Justices' conviction that, whatever the proper definition of patentable subject matter may be, the business method at issue in *Bilski* "clearly" did not qualify.[53] Anyone reading the Court's decision might get the impression that patentable subject matter is like obscenity—we know it when we see it.[54]

In most cases, however, the courts' reliance on intuitive decision-making is subtler. Again, in most cases the courts cite to statutory language, judicial precedent, rules, doctrines, policies and rationales in justifying their decisions, but more rigorous analysis shows that these justifications do not actually explain the outcomes. The following section reviews the various rationales and doctrines that have supposedly dictated patentable subject matter determinations to demonstrate this fact in more detail.

III. PATENTABLE SUBJECT MATTER AS INTUITION

The statutory and common law categories of patentable and unpatentable subject matter are best viewed as rough classifications, and as such require some interpretation. Patent law is a one-size-fits-all system, after all, and any attempt to divide all technologies ever invented and yet to be invented into neat, self-defining categories would be impossible.

The patent system has therefore devised an array of linguistic frameworks for delineating patentable subject matter, such as the new machine doctrine, the mental steps doctrine, the useful, concrete, and tangible result test, the machine or transformation test, and more.[55] Rather than clarifying patentable subject matter, however, the courts in effect have created just another level of abstraction, this time by using judicial doctrines and tests to define the categories

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50. Bilski v. Kappos, 130 S. Ct. 3218, 3231 (2010).

51. *Id.*

52. *See generally* Andrew Chin, The Elusive "Marketplace" in Post-Bilski Jurisprudence, 34 CAMP. L. REV. 663 (2012) (criticizing the *Bilski* decision for its lack of guidance); Collins, Bilski, *supra* note 6, at 39; Eisenberg, *supra* note 6, at 18–19 (similar).

53. *Bilski*, 130 S. Ct. at 3231; *see also id.* at 3236 (Stevens, J., concurring) ("The Court, in sum, never provides a satisfying account of what constitutes an unpatentable abstract idea"); Collins, Bilski, *supra* note 6, at 39 (characterizing the Court's decision "as a bald and unreasoned assertion"); Joseph Scott Miller, Symposium, *Introduction*, 15 LEWIS & CLARK L. REV. 1, 7 (2011) (describing Court's *Bilski* decision as "more gesture than analysis").

54. *See* Collins, Bilski, *supra* note 6, at 39 (quoting Jacobellis v. Ohio, 378 U.S. 184, 197 (1964) (Stewart, J., concurring)); Eisenberg, *supra* note 6, at 45 (characterizing patentable subject matter as "seat-of-the-pants intuitions of jurists from earlier eras").

55. *See Bilski*, 130 S. Ct. at 3224 (quoting *In re* Bilski, 545 F.3d 943, 954, 955, 960 n.19 (Fed. Cir. 2008) (en banc)).

of included and excluded subject matter that in turn are supposed to define patentable technology. The overall effect is to shift the focus of patentable subject matter to yet other inquiries that have proven rather unstable over time. The various judicial doctrines and tests have invariably been ill-equipped to deal with the vicissitudes of technological progress. The courts have had to create so many exceptions to, and otherwise stretch, these tests that most are ultimately discarded as unworkable.[56]

The ultimate root of the problem is that what patentable subject matter restrictions will best further the patent system's constitutional purpose of promoting Progress in useful Arts is simply unknown and unknowable.[57] How can the patent system define the categories of included or excluded subject matter, or doctrines to differentiate between the two, when the question of whether the patent system has any effect at all, much less how to optimize those effects is indeterminable.[58] The indeterminacy of what kind of subject matter should or should not be patentable has resulted in a series of what is nothing more than *ipse dixit*. The courts have merely assumed that the categories of unpatentable subject matter are deemed so because the categories in some way would hinder, or at least would not promote, such progress.[59] This assumption, in turn, has given rise to a number of derivative rationales such as the idea that patents on discoveries would preempt too much future innovation, that certain classes of subject matter do not need patent incentives, that only man-made inventions promote technological progress, and so on.[60]

Although these policy-based rationales sound like pragmatic and economically driven explanations for patentable subject matter, they actually explain very little and are instead often more confusing than helpful. When compared to how the courts actually decide patentable subject matter cases, the various derivative rationales have limited explanatory power. If actually applied, the derivative rationales would be both underinclusive and overinclusive and even contradictory at times, excluding much of what the courts and the United States Patent and Trademark Office (PTO) have held to be patentable technology, while including much of what the courts and the PTO have rejected as unpatentable. The various statutory and common law categories, judicial doctrines and tests, and policy-derived rationales cited for patentable subject matter determinations are merely post hoc rationalizations in support of determinations apparently made by other means. Instead, what actually drives

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56. *See In re* Bilski, 545 F.3d at 958–60.

57. U.S. CONST. art. I, § 8, cl. 8.

58. *See* Tun-Jen Chiang, *Defining Patent Scope by the Novelty of the Idea*, 89 WASH. U.L. REV. 1211, 1239 (2012); Duff, *supra* note 5, at 619–20; Eisenberg, *supra* note 6, at 45. *But see* Olson, *supra* note 12 (arguing that we can set patentable subject matter restrictions to include only innovations that would not have arisen without patent incentives).

59. *See generally* Allen K. Yu, *Within Subject Matter Eligibility—A Disease and a Cure*, 84 S. CAL. L. REV. 387 (2011) (questioning whether current doctrine truly promotes progress).

60. *See infra* Part II.

patentable subject matter is an intuitive sense of what constitutes patentable technology.

A. The Preemption Rationale

The most frequently cited rationale for categorizing phenomena of nature, laws of nature, and abstract ideas as unpatentable subject matter focuses on the potential harms, particularly to future innovation.[61] Under this rationale, phenomena of nature, laws of nature, and abstract ideas are themselves not technology but rather serve as the essential building blocks, fundamental principles, and "basic tools of scientific and technological work" from which technology is made.[62] Patenting such foundational elements such as natural phenomena would monopolize and preempt the use of these basic building blocks,[63] hindering rather than promoting future invention by creating patent anticommons, thickets, or other holdup problems.[64] This rationale thus depicts phenomena of nature, laws of nature, and abstract ideas as categorically and fundamentally different in their breadth of scope and consequent effect on future invention.[65] The concern that patenting phenomena of nature, laws of nature, and abstract ideas would categorically hinder future invention may be a very valid one, but in terms of patentable subject matter, this concern is a bit of misdirection because it does not reflect how courts actually distinguish patentable inventions from unpatentable phenomena of nature.

At first glance, the argument against patenting "fundamental building blocks" such as natural phenomena may seem quite sound, for "all inventions at some level embody, use, reflect, rest upon, or apply laws of nature, natural phenomena, or abstract ideas."[66] Taken in its most literal form, however, this building block rationale argues too much. It is not just natural phenomena, laws of nature, or abstract ideas that serve as the building blocks for future inventions;

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61. Ass'n for Molecular Pathology v. Myriad Genetics, Inc., 133 S.Ct. 2107, 2116 (2013); Mayo Collaborative Servs. v. Prometheus Labs., 132 S.Ct. 1289, 1293 (2012); Alice Corp. Pty., Ltd. v. CLS Bank Int'l, 134 S. Ct. 2347, 2354 (2014).

62. *Id.* (quoting *Ass'n for Molecular Pathology* 133 S. Ct. at 2116); *see generally* Katherine J. Strandburg, *Much Ado Preemption*, 50 HOUS. L. REV. 563 (2012) (discussing the "preemption" rationale of patentable subject matter).

63. *See Alice Corp.*, 134 S. Ct. at 2354; *Mayo Collaborative Servs.*, 132 S. Ct. at 1294; Bilski v. Kappos, 130 S. Ct. 3218, 3231 (2010); Parker v. Flook, 437 U. S. 584, 589–90 (1978) (quoting *Benson*, 409 U.S. at 71–72).

64. *See* Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCI. 698, 699 (1998); Arti Kaur Rai, *Regulating Scientific Research: Intellectual Property Rights and the Norms of Science*, 94 NW. U. L. REV. 77, 120–35 (1999); Joshua D. Sarnoff, *Patent-Eligible Inventions After* Bilski*: History and Theory*, 63 HASTINGS L.J. 53, 120 (2011).

65. *See* Sarnoff, *supra* note 64, at 120.

66. *Alice Corp.*, 134 S. Ct. at 2354 (quoting *Mayo Collaborative Servs.*, 132 S. Ct. at 1293); *Ass'n for Molecular Pathology*, 133 S. Ct. at 2116 (quoting *Mayo Collaborative Servs.*, 132 S. Ct. at 1293).

technology is inherently cumulative, and any invention patented today may serve as a building block for further inventions created tomorrow.[67] If the patent system were to exclude as unpatentable anything that might serve as a foundation for future invention, it would have to exclude most, if not all, patentable inventions as well because all patents grant technological monopolies over, and thereby preempt, the claimed subject matter regardless of what that subject matter might be.[68]

The courts do not actually distinguish patentable from unpatentable subject matter on the basis of their respective preemptive breadth; moreover, judgments about future preemptive effects are often quite speculative.[69] As the Supreme Court recently explained in *Mayo Collaborative Services v. Prometheus Laboratories*, "our cases have not distinguished among different laws of nature according to whether or not the principles they embody are sufficiently narrow [because c]ourts and judges are not institutionally well suited to making the kinds of judgments [needed] to distinguish among different laws of nature."[70] The courts instead concede to using the categories of excluded subject matter as proxies for their concerns about preemption.[71] There is good reason to doubt that the current categories of excluded subject matter serve as reliable proxies for preemptive breadth, however.

First, the preemptive effect of a patent is much more complicated than just the nature of its subject matter. The preemptive effect of any given patent depends on how difficult it is for later inventors to invent around that patent; the more future inventive efforts depend on access to a patent's claimed subject matter, the broader that patent's ability will be to hold up future development.[72] Broad patents covering a wide range of embodiments can obviously pose the risk of broad preemptive effects, but so might relatively narrow patents covering only one or two embodiments, especially if those embodiments are essential to future developments. Preemption depends not so much on claim breadth or the breadth of covered embodiments as on preemptive breadth—breadth of later inventive efforts that might need to incorporate one or more of those embodiments.[73]

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67. *See generally* Suzanne Scotchmer, *Standing on the Shoulders of Giants: Cumulative Research and the Patent Law*, 5 J. ECON. PERSPECTIVES 29 (1991) (discussing the cumulative nature of technological development).

68. *See* CLS Bank Int'l v. Alice Corp. Pty., 717 F.3d 1269, 1281 (Fed. Cir. 2013) (Lourie, J., concurring); Rochelle C. Dreyfuss & James P. Evans, *From* Bilski *Back to* Benson*: Preemption, Inventing Around, and the Case of Genetic Diagnostics*, 63 STAN. L. REV. 1349, 1371 (2011); Strandburg, *supra* note 62, at 588–89.

69. Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 848 (1990).

70. 132 S. Ct. 1289, 1303 (2012).

71. *See id.*

72. *See generally* Dreyfuss & Evans, *supra* note 68, at Pt.III (arguing that preemptive effects depend on the "ability to invent around").

73. *See* Collins, Bilski, *supra* note 6, at 58–59 (discussing Gottschalk v. Benson, 409 U.S. 63, 67 (1972)); Dreyfuss & Evans *supra* note 68, at 1371; Strandburg, *supra* note 62, at 588–89.

A patent's preemptive breadth thus hinges on not just how many embodiments are covered or whether the claimed subject matter has any meaningful substitutes, but also whether future technological development would have any need for either the patented invention or its substitutes.[74] This, in turn, depends at least as much, if not more, on the nature of the technology at issue, how likely inventors in that area of technology are to license to each other, and how easy it is to design around the patented subject matter.[75] Unless there is reason to believe that phenomena of nature, laws of nature, and abstract ideas categorically tend to be more preemptive along all these dimensions, it is difficult to see why the patent system should exclude laws and phenomena of nature as unpatentable on that basis.[76]

For example, patentable processes, machines, manufactures, and compositions of matter can often have a significant preemptive effect, while unpatentable subject matter often has relatively little impact one way or the other on future inventions. Patents on pioneering new technologies, for example, can be broad in scope because they open entirely new areas of technological research and development.[77] Integrated circuits revolutionized the electronics industry, just as recombinant DNA and polymerase chain reaction (PCR) techniques enabled genetic engineering and the scanning tunneling microscope, and the atomic force microscopes made nanotechnology possible.[78] To work in electronics, genetic engineering, or nanotechnology, one must have access to these foundational inventions, and as a consequence the patents on these technologies had broad power to preempt future developments in their respective fields by effectively controlling entry into the field.[79]

Many phenomena of nature, laws of nature, and abstract ideas, on the other hand, can be quite limited in scope and potential preemptive effect.[80] Take the

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74. *See* Collins, Bilski, *supra* note 6, at 58–59 (quoting Gottschalk v. Benson, 409 U.S. 63, 67 (1972) (discussing the idea that "almost all technological progress builds on a foundation provided by earlier innovators)); Dreyfuss & Evans, *supra* note 68, at 1371; Strandburg, *supra* note 62, at 588–89.

75. Dreyfuss & Evans, *supra* note 68, at 1371–72; Merges & Nelson, *supra* note 69, at 848; Strandburg, *supra* note 62, at 579.

76. Strandburg, *supra* note 62, at 590 (noting that this is an implausible assumption).

77. John R. Thomas, *The Question Concerning Patent Law and Pioneer Inventions*, 10 HIGH TECH. L.J. 35, 36–37 (1995) (citing Graver Tank & Mfg. Co. v. Linde Air Prods, Co., 339 U.S. 605, 608 (1950)).

78. *See* Michael L. Darby & Lynne G. Zucker, *Grilichesian Breakthroughs: Inventions of Methods of Inventing and Firm Entry in Nanotechnology*, *in* [No. 79/80] ANNALES D'ECONOMIE ET DE STATISTIQUE 146, 146 & n.3 (Ass'n Dev. Res. Econ. & Stat., ed. 2005); Mark A. Lemley, *Patenting Nanotachnology*, 58 STAN. L. REV. 601, 610–11 (2005).

79. *See* O'Reilly v. Morse, 56 U.S. 62, 133–34 (1853); *see also* Strandburg, *supra* note 62, at 580–82.

80. *See, e.g.*, Mayo Collaborative Servs. v. Prometheus Labs., 132 S. Ct. 1289, 1303 (2012) (referencing patents on nature); *see also* Strandburg, *supra* note 62, at 577–78 (quoting Gottschalk v. Benson, 409 U.S. 63, 67 (1972)) (Not all 'phenomena of nature, though just discovered, mental processes and abstract intellectual concepts' have sweeping downstream impact . . . .").

invention at issue in *Funk Brothers Seed Co. v. Kalo Inoculant Co.*,[81] for example. *Funk Brothers* involved a patent on an inoculant for leguminous crops made by combining certain nitrogen-fixing root nodule bacteria strains.[82] The Supreme Court invalidated the patent as nothing more than "the handiwork of nature."[83] This patent nonetheless covered only selected species of Rhizobium bacteria, only selected strains of those species in combination, and only as an inoculant for legumes.[84] All other Rhizobium bacteria, as well as even the particular strains of bacteria that Bond used in his inoculant, remained free for use in other combinations or other inventions.[85]

Similarly, an abstract idea can be quite narrow in both claim breadth and potential preemptive breadth, as Justice Stevens suggested in his concurrence in *Bilski v. Kappos*.[86] And if a person were to attempt to patent a cat for use as a pet or the sum of a social security number, an age, and the number of socks in one's closet at any given time for use as a lottery number, both of those patents would be rejected as a phenomenon of nature and an abstract idea, respectively, even though they are narrow enough in both claim and preemptive scope that no future inventor would ever care about such patents.[87]

Perhaps because phenomena of nature, laws of nature, and abstract ideas are clearly not the only subject matter that can have broad preemptive effects, the Supreme Court recently tried to shift the focus, explaining that while preemptive scope per se may not be problematic, the concern is nonetheless a "*relative* one: how much future innovation is foreclosed relative to the contribution of the inventor."[88] Regardless of whether it is broad or narrow in scope, the Court suggested that unpatentable subject matter has so little creative value that it invariably detracts from technological progress more than it contributes.[89]

For example, in the recent Supreme Court decision, *Mayo Collaborative Services v. Prometheus Laboratories*, the patent at issue involved a method of improving thiopurine treatment of autoimmune disorders by administering the thiopurine, measuring the patient's thiopurine metabolite levels, and then

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81. 333 U.S. 127, 131 (1948).

82. *Id.* at 130–31.

83. *Id.* at 130.

84. *Id.* at 129.

85. *Id.* at 130; *see also* Strandburg, *supra* note 62, at 583 (observing that the invention in *Funk Bros.* was no more preemptive than the one in *Chakrabarty*). *But see* Sichelman, *supra* note 73, at 377 (describing *Funk*'s inoculant as foreclosing too much future innovation).

86. *See* Bilski v. Kappos, 130 S. Ct. 3218, 3235 (2010) (Stevens, J., concurring).

87. *Cf.* Kevin Emerson Collins, *Claims to Information* Qua *Information and a Structural Theory of Section 101*, 4 I/S: J.L. & POL'Y FOR INFO. SOC'Y 11, 22 (2008) (noting that even definite, "bounded" information would be unpatentable under Section 101).

88. Mayo Collaborative Servs. v. Prometheus Labs., 132 S. Ct. 1289, 1303 (2012) (emphasis in original); *accord* Great Atl. & Pac. Tea Co. v. Supermarket Equip. Corp., 340 U.S. 147, 152–53 (1950); *see also generally* Mark A. Lemley et al., *Life After* Bilski, 63 STAN. L. REV. 1315, 1330 (2011) ("The question is whether the inventor has contributed enough to merit a claim so broad that others will be locked out").

89. Mayo Collaborative Servs., 132 S. Ct. at 1303.

adjusting subsequent thiopurine doses according to that data.[90] The Supreme Court acknowledged that the patent at issue was narrow in scope, but the Court held that the patent nevertheless "would risk disproportionately tying up the use of the underlying natural laws" relative to its contribution to the field.[91] Although the diagnostic method in *Prometheus* appeared to be novel, non-obvious, enabled, and useful, the Court invalidated it as overly broad and unpatentable subject matter.[92]

Although it is an arguably more nuanced rationale, there is much reason to doubt that all phenomena of nature, laws of nature, and abstract ideas are even disproportionately broad in preemptive scope. Again, phenomena of nature, laws of nature, and abstract ideas can be quite narrow in scope, while many discoveries about natural phenomena and laws can be pivotal contributions to technological progress by facilitating later invention and even by opening up new fields of technology.[93] "[T]he inventions most benefiting mankind are those that 'push back the frontiers of chemistry, physics, and the like.'"[94] Identification of the double helical structure of DNA, the unusual characteristic materials at the nanoscopic level, and other such natural phenomena have played a seminal role in advancing technological progress.[95] Even the Court in *Funk Brothers* admitted that the invention at issue was "ingenious," and saved farmers from having to buy and work with multiple inoculants.[96] One cannot simply dismiss laws and phenomena of nature on the assumption that they necessarily hinder more future progress than they promote.[97]

Many processes, machines, manufactures, and compositions of matter, on the other hand, contribute very little to technological progress and yet are considered patentable subject matter. Indeed, some so-called pioneering patents may play only a comparatively small role in later applications depending on how much additional technological investment and development the later applications require.[98] The patent system nonetheless allows such pioneering inventions,

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90. *Id.* at 1294–95.

91. *Id.* at 1294.

92. *Id.* at 1301.

93. *See, e.g.*, Coulter, *supra* note 8, at 498 ("[A]dvances of pure science have paved the way for further advances of the useful arts . . . .").

94. Diamond v. Chakrabarty, 447 U.S. 303, 316 (1980) (quoting Great At. & Pac. Tea Co. v. Supermarket Corp., 340 U.S. 147, 154 (1950) (concurring opinion)); *accord* Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 548 U.S. 124, 126–27 (2006) (Breyer, J., dissenting) ("[Discoveries about nature] may prove of great benefit to the human race.").

95. *See, e.g.*, John J. Doll, *The Patenting of DNA*, 280 SCIENCE 689, 689–90 (1998) (discussing DNA); Lemley, *supra* note 78, at 602 (discussing nanotechnology).

96. Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 131 (1948).

97. *See, e.g.*, ROBERT PATRICK MERGES & JOHN FITZGERALD DUFFY, PATENT LAW AND POLICY: CASES AND MATERIALS 77 (LexisNexis ed., 5th ed. 2011) (quoting *Diamond v. Chakrabarty*, 447 U.S. 303, 316 (1980)) (noting that some unpatentable subject matter has benefitted mankind more than some marginal but patentable innovations); Scotchmer, *supra* note 67, at 31 (noting the multiple ways in which basic research facilitates later innovation).

98. *See* Merges & Nelson, *supra* note 69, at 865–66; Scotchmer, *supra* note 67, at 31.

often granting them broad patent protection,[99] even if they have the potential to block downstream developments while providing relatively little contribution of their own.[100]

The way in which courts actually decide cases also belies any claim that patentable subject matter is about preemptive scope. If preemptive scope were truly a motivating concern, the patent system would place greater emphasis on the characteristics of a claimed invention that more directly relate to its preemptive potential. The courts seem instead to reject such preemption specific approaches.

For example, for many years the courts applied the *Freeman-Walter-Abele* test, named after the three cases in which the Federal Circuit developed the test to determine whether processes or other claims would preempt mathematical algorithms.[101] The first step was to determine whether the claim even recited a mathematical algorithm or mental step and, if so, the second step looked at whether the algorithm was "applied in [some] manner to [specific] physical elements or [physical] process steps" and that those elements or steps would themselves would be "statutory subject matter."[102]

Freeman-Walter-Abele did not last long, however. Criticized for its perceived focus on single claim elements rather than the invention as a whole,[103] the *Freeman-Walter-Abele* test was soon replaced. In *In re Alappat* the Federal Circuit stated that the correct test required only that the process at issue yield a useful, concrete, and tangible result.[104] Like the *Freeman-Walter-Abele* test, the

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99. Because "pioneers" patents face little scope-limiting prior art, they often enjoy quite broad claim—and preemptive—scope. Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1656–57 (2003) (discussing broad range of protection); *see also* Perkin-Elmer Corp. v. Westinghouse Elec. Corp., 822 F.2d 1528, 1532 (Fed. Cir. 1987) (citing Sealed Air Corp v. U. S. Int'l Trade Comm'n, 645 F.2d 976, 984 (C.C.P.A. 1981)) ("A pioneer invention is entitled to a broad range of equivalents.").

100. Merges & Nelson, *supra* note 69, at 865–68 (quoting Boyden Power-Brake Co. v. Westinghouse 170 U.S. 537, 572 (1898); Texas Instruments v. U.S. Int'l Trade Comm'n, 846 F.2d 1369, 1372 (Fed. Cir. 1988)) (discussing methods of judging infringement, such as the reverse doctrine of equivalents, that can help remedy this effect); Scotchmer, *supra* note 67, at 37–38 (noting uncertainty of optimal patent breadth for inventions that enable future inventions).

101. *In re* Abele, 684 F.2d 902, 905–07 (C.C.P.A. 1982) (citations omitted); *In re* Walter, 618 F.2d 758, 767 (C.C.P.A. 1980); *In re* Freeman, 573 F.2d 1237, 1245 (C.C.P.A. 1978) (citing Gottschalk v. Benson, 409 U.S. 63, 71 (1972)).

102. *In re* Abele, 684 F.2d at 906–07 (quoting *In re* Walter, 618 F.2d at 767); *accord* Arrhythmia Res. Tech. v. Corazonix Corp., 958 F.2d 1053, 1058–59 (Fed. Cir. 1992); *In re* Grams, 888 F.2d 835, 838–39 (Fed. Cir. 1989) (quoting *In re* Meyer, 688 F.2d 789, 796 (C.C.P.A. 1982); *In re* Abele, 684 F.2d at 907).

103. *In re* Bilski, 545 F.3d 943, 958–59 (Fed. Cir. 2008) (en banc) (quoting *In re* Abele, 684 F.2d at 905–07); AT&T Corp. v. Excel Comm. Mktg., Inc., 172 F.3d 1352, 1356 (Fed. Cir. 1999); Vincent Chiappetta, *Patentability of Compute Software Instruction as an "Article of Manufacture:" Software as Such as the Right Stuff*, 17 J. MARSHALL J. COMPUTER & INFO L. 89, 108 n.85 (1998).

104. 33 F.3d 1526 (Fed. Cir. 1994); *see also AT&T Corp.*, 172 F.3d at 1357 (citing *In re* Alappat, 33 F.3d 1526, 1544 (Fed. Cir. 1994)); *Interim Guidelines*, *supra* note 23, at 45–46 (quoting *State St. Bank & Trust Co. v. Sig. Fin. Grp., Inc.*, 149 F.3d 1368, 1374 (Fed. Cir. 1998); *In re*

useful, concrete, and tangible test was at least nominally designed to prevent patentees from wholly preempting mathematical algorithms or laws of nature.[105] Unlike the *Freeman-Walter-Abele* test, however, the useful, concrete, and tangible test required only that a process employ particular steps to accomplish specific and useful functions in order to avoid preemption.[106] The useful, concrete, and tangible test was thus more expansive than *Freeman-Walter-Abele*, and rejected any requirement that an algorithm or mental step be limited by physical elements.[107] The most famous applications of the useful, concrete, and tangible test were in *State Street Bank & Trust Co. v. Signature Finance Group, Inc.* and *AT&T Corp. v. Excel Communications*, in which the Federal Circuit approved two business methods, one as claimed on a computer and one as claimed as a pure method, respectively.[108] However, the useful, concrete, and tangible test quickly came under fire for its liberality, particularly because it seemed to open the door to freely patenting business methods and computer software.[109] The Federal Circuit soon discarded the test in *In re Bilski*, a move that the Supreme Court endorsed.[110]

The Federal Circuit instead moved on to the machine or transformation test. Under this test, a process is patentable if it either: (1) is tied to a particular machine or apparatus, or (2) transforms a particular article into a different state or thing.[111] Under this test, the Federal Circuit in *In re Bilski* rejected a business method for hedging investment risk because the method did not satisfy the test.[112] The Supreme Court subsequently cautioned that the machine or transformation test is not the sole test for processes but acknowledged that the test is a "useful and important clue, an investigative tool, for determining whether some claimed inventions are processes under § 101."[113] The lower

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Alappat, 33 F.3d at 1543 n.21; *AT&T Corp.*, 172 F.3d at 1359) (citing Diamond v. Diehr, 450 U.S. 175 (1981); Diamond v. Chakrabarty, 447 U.S. 303 (1980)); Cohen & Lemley, *supra* note 15, at 10.

105. *AT&T Corp.*, 172 F.3d at 1357 (citing *In re* Alappat, 33 F.3d at 1570); *Interim Guidelines*, *supra* note 23, at 20 (quoting *AT&T Corp.*, 172 F.3d at 1358) (citing 35 U.S.C. § 101 (2012)).

106. *In re* Alappat, 33 F.3d at 1570 (quoting Gottschalk v. Benson, 409 U.S. 63, 67 (1972)); *Interim Guidelines*, *supra* note 23, at 20 (citing 35 U.S.C. § 101).

107. *AT&T Corp.*, 172 F.3d at 1359–60 (citations omitted).

108. *AT&T Corp.*, 172 F.3d at 1357–58; *State Street Bank*, 149 F.3d at 1373.

109. *See In re* Bilski, 545 F.3d 943, 1004 (Fed. Cir. 2008) (en banc) (Mayer, J., dissenting); Dan L. Burk, *Patenting Speech*, 79 TEX. L. REV. 99, 139–40 (2000); Chiappetta, *supra* note 103, at 111–12 (quoting and citing *Alappat*, 33 F. 3d at 1544–45).

110. Bilski v. Kappos, 130 S. Ct. 3218, 3231; *id.* at 3232 n.1 (2010) (Stevens, J., concurring) (quoting *State Street*, 149 F.3d at 1373); *In re Bilski*, 545 F.3d at 960; *see also* Lab. Corp. v. Metabolite Labs., Inc., 548 U.S. 124, 136 (2006) (Breyer, J., dissenting) (quoting *State Street*, 149 F.3d at 1373) (criticizing the useful, concrete, and tangible test).

111. *In re Bilski*, 545 F.3d at 961.

112. *Id.* at 964–65.

113. *Bilski*, 130 S. Ct. at 3227.

courts have therefore continued to use the machine or transformation test as "a useful and important clue" under Section 101.[114]

Why did the Federal Circuit reject the useful, concrete, and tangible test in favor of the machine or transformation test? All three tests for processes—the *Freeman-Walter-Abele* test, the machine or transformation test, and the useful, concrete, and tangible test—were designed to prevent inventors from preempting fundamental principles like mathematical algorithms. The useful, concrete, and tangible test, however, clearly allowed patents of greater breadth than either the *Freeman-Walter-Abele* or machine-or-transformation test.[115] If overbreadth were truly a motivating concern, why not retain *Freeman-Walter-Abele*'s scope narrowing physicality requirements or the machine or transformation test's similar requirements?

Despite their scope narrowing effects, the *Bilski* court nonetheless rejected the requirements under the *Freeman-Walter-Abele* and machine or transformation tests as too inflexible.[116] The court's reservations about the machine or transformation test connote the court's sense that, while useful, bright-line rules such as the machine or transformation test do not capture what distinguishes patentable from unpatentable subject matter. With regard to the machine or transformation test, for instance, the Supreme Court explained that the test "would create uncertainty" about Information Age technologies, suggesting that some inventions may be patentable subject matter even if not tied to machines, transformations, or physical elements.[117] Other inventions that do involve machines or transformative effects, on the other hand, have often been held not to be patentable subject matter.[118]

The courts' rejection of the *Freeman-Walter-Abele* and machine or transformation tests relates to yet another reason to doubt that patentable subject restrictions have anything to do with preemptive scope. Again, if overbreadth were truly a motivating concern, any scope narrowing limitations, whether *Freeman-Walter-Abele*'s required physical limitations, the machine or transformation test's required machine or transformation limitations, or any other limitations would presumably be important to patentable subject matter analyses. Adding limitations to a patent claim narrows its scope by leaving both future inventors and the public free to use the claimed subject matter outside of those limitations.[119] Put differently, the more limitations appended to any particular

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114. Bancorp Servs., L.L.C. v. Sun Life Assurance Co., 687 F.3d 1266, 1278 (Fed. Cir. 2012) (quoting *In re* Biliski, 130 S. Ct. at 3227); *accord* PerkinElmer, In. v. Intema Ltd., 496 Fed. Appx 65m 72–73 (Fed. Cir. 2012); CyberSource Corp. v. Retail Decisions, Inc., 654 F.3d 1366, 1371 (Cir. 2011) (quoting *Bilski*, 130 S. Ct. at 3227).

115. *See, e.g.*, JAMES BESSEN & MICHAEL MEURER, PATENT FAILURE 211 (2008) (citations omitted); Dreyfuss & Evans, *supra* note 68, at 1359 (discussing the "broad reach" of the test).

116. *Bilski*, 130 S. Ct. at 3227.

117. *Id.*

118. *See infra* text accompanying notes 132–34, 248–57.

119. *See, e.g.*, Parker v. Flook, 437 U.S. 584, 589–90 (1978) (quoting Gottschalk v. Benson, 409 U.S. 63, 67 (1972)) ("Respondent correctly points out that [he] does not seek to 'wholly

claim, the less preemptive scope the claim has and the easier it is for future inventors to design around that claim.[120]

The courts often reject the addition of such scope narrowing limitations as insufficient to affect the patentable subject matter analysis, however.[121] In many cases courts have dismissed scope narrowing restrictions as "token," "insignificant," or "well-understood, routine, [and] conventional."[122] For example, courts have rejected attempts to limit claims to what they viewed as algorithms or other abstract ideas, dismissing data gathering steps as "meaningless limits" and "insignificant extra-solution activity;"[123] computer readable medium limitations as not "sufficiently meaningful;"[124] and limitations to a "general purpose" computer as "an obvious mechanism."[125] Similarly, the patent in *Funk Brothers* was limited in patent scope to only certain combinations of Rhizobium bacteria and only to their use in inoculating leguminous plants.[126] If patentable subject matter restrictions were truly driven by concerns about breadth, preemptive or otherwise, the patentability of Bond's inoculant presumably would have risen or fallen on the question of whether its patent's limitations adequately narrowed its scope. Instead, the Supreme Court brushed Kalo Inoculant Company's claim limitations aside as "hardly more than an advance in the packaging of the inoculants."[127]

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preempt the mathematical formula,' since there are uses of his formula outside the petrochemical and oil-refining industries that remain in the public domain."); *see also* Strandburg, *supra* note 62, at 585–86, 588–89 (discussing per se exclusions).

120. Dreyfuss & Evans, *supra* note 68, at 1371–72.

121. *See* Alice Corp. Pty., Ltd. v. CLS Bank Int'l, 134 S. Ct. 2347, 2358–59 (2014); Mayo Collaborative Servs. v. Prometheus Labs., 132 S. Ct. 1289, 1298 (2012); Bilski v. Kappos, 130 S. Ct. 3218, 3230 (2010); *Flook*, 437 U.S. at 590; Classen Immunotherapies, Inc. v. Biogen IDEC, 659 F.3d 1057, 1067 (Fed. Cir. 2011) (quoting *Bilski*, 130 S. Ct. at 3225, 3230).

122. *Mayo Collaborative Servs.*, 132 S. Ct. at 1298; *Bilski*, 130 S. Ct. at 3230 (quoting *Diehr*, 450 U.S. at 191 (1981)); *Flook*, 437 U.S. at 590.

123. *See Flook*, 437 U.S. at 590; *Classen Immunotherapies, Inc.*, 659 F.3d at 1067; *In re* Bilski, 545 F.3d 943, 963 (Fed. Cir. 2008) (en banc); *In re* Grams, 888 F.2d 835, 839–41 (Fed. Cir. 1989); *In re* Meyer, 688 F.2d 789, 794 (C.C.P.A. 1982) (citing *In re* Richman, 563 F.2d 1026 (C.C.P.A. 1977)).

124. CyberSource Corp. v. Retail Decisions, Inc., 654 F.3d 1366, 1375 (Fed. Cir. 2011); *see also In re Meyer*, 688 F.2d at 795 n.3 (holding appellants' apparatus claims not to differ from method claims).

125. *See* CLS Bank Int'l v. Alice Corp. Pty., 717 F.3d 1269, 1302 (Fed. Cir. 2013); Bancorp Servs. v. Sun Life Assurance, 687 F.3d 1266, 1278 (Fed. Cir. 2012); *see also* SiRF Tech., Inc. v. Int'l Trade Comm'n, 601 F.3d 1319, 1333 (Fed. Cir. 2010) ("[F]or the addition of a machine to impose a meaningful limit on the scope of a claim, it must play a significant part in permitting the claimed method to be performed, rather than function solely as an obvious mechanism for permitting a solution to be achieved more quickly[.]"); *In re Meyer*, 688 F.2d at 795 n.3; *see generally* Bernard Chao, *Finding the Point of Novelty in Software Patents*, 28 BERKELEY TECH. L. REV. 1217 (2013) (discussing patent eligibility determinations for software patents).

126. Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1948); *see also* Strandburg, *supra* note 62, at 583 (remarking on the narrowness of the *Funk* patent).

127. *Funk Bros.*, 333 U.S. at 131.

Again, if preempting future inventive efforts were truly a concern, why not allow claims to phenomena of nature, laws of nature, or abstract ideas if the claims added adequate scope narrowing limitations, no matter how token or conventional those limitations might be? To be sure, limitations such as field of use restrictions, data gathering steps, or means plus function machine elements may not do much to narrow claim scope because those limitations are phrased in such broad or functional terms,[128] but they are still limiting. The patent system's characterization and disapproval of some limitations as token or insignificant attest to the fact that patentable subject matter is not about claim breadth, much less preemptive breadth. Indeed, courts make this fact clear.[129] The term preemption as used in relation to patentable subject matter determinations refers not to the breadth of future inventive or research efforts on which a patent might encroach. Rather, the concern is about preempting—that is, patenting—the unpatentable subject matter itself. "Why not permit patentees to avoid overbroad pre-emption by limiting claim scope to particular fields of use? This tension is resolved, however by recalling the purpose behind the Supreme Court's discussion of pre-emption, namely that pre-emption is merely an indication that a claim seeks to cover a fundamental principle itself rather than only a specific application of that principle.[130] In other words, courts must first identify whether an invention involves a phenomenon, law of nature, or an abstract idea with the question of "preemption" then becoming an inquiry solely into whether the invention adds anything else.[131] Preemptive effects on future innovation thus plays no role in either identifying the unpatentable subject matter as such or, more importantly, explaining why it is unpatentable.

Moreover, in deciding whether a limitation is "meaningful," "substantive,"[132] and "actually limiting *in the sense required under § 101*,"[133] the courts are looking for something that is not just scope limiting but also technological in nature. The courts refer to this technological quality in various ways: whether the limitations meaningfully restrict the claim as a whole to "an

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128. *See* Bilski v. Kappos, 130 S. Ct. 3218, 3231 (2010) (citing *Flook*, 437 U.S. at 593); *In re* Abele, 684 F.2d 902, 909 (C.C.P.A. 1982); *In re Grams*, 888 F.2d at 839–40 (quoting *In re* Christensen, 478 F.2d 1392, 1394 (C.C.P.A. 1973); *In re* Sarkar, 588 F.2d 1330, 1335 (C.C.P.A. 1978)).

129. *See, e.g.*, *CLS Bank Int'l*, 717 F.3d at 1281; *In re* Bilski, 545 F.3d 943, 957 (Fed. Cir. 2008) (en banc); Arrhythmia Res. Tech. v. Corazonix Corp., 958 F.2d 1053, 1057 (Fed. Cir. 1992); *In re* Walter, 618 F.2d 758, 767 (C.C.P.A. 1980); *see also* Strandburg, *supra* note 62, at 566 (pointing out that the Supreme Court's decisions do not turn on claim breadth).

130. *In re Bilski*, 545 F.3d at 957; *accord* Mayo Collaborative Servs. v. Prometheus Labs., 132 S. Ct. 1289, 1294 (2012); *CLS Bank Int'l*, 717 F.3d at 1281 ("[T]he animating concern is that claims should not be coextensive with a natural law, natural phenomenon, or abstract idea.").

131. Accenture Global Servs., GmbH v. Guidewire Software, Inc., 728 F.3d 1336, 1341 (Fed. Cir. 2013) (citing *CLS Bank Int'l*, 717 F.3d at 1282); Ultramercial, Inc. v. Hulu, LLC, 722 F.3d 1335, 1354–55 (Fed. Cir. 2013) (Lourie, J., concurring) (quoting *CLS Bank Int'l*, 717 F.3d at 1282).

132. Alice Corp. Pty. Ltd. v. CLS Bank Int'l, 134 S. Ct. 2347, 2360 (2014) (quoting *CLS Bank Int'l*, 717 F.3d at 1291).

133. *CLS Bank Int'l*, 717 F.3d at 1282, 1291 (emphasis added).

application;"[134] whether those limitations provide some "'significant 'inventive concept;'"[135] or whether the limitations lead to creative value rather than narrowed scope.[136] As the Supreme Court recently explained in *Alice Corp Pty., Ltd. v. CLS Bank Ltd.*, patentable subject matter depends on whether the claimed invention evinces some "technological" improvement or advance.[137]

Furthermore, if the courts were truly concerned about policing potential disproportionality between a claimed invention's technological value and its preemptive scope, why would they look to patentable subject matter restrictions to do so? The patentability requirements of novelty, non-obviousness, utility, and full disclosure (particularly enablement) "serve a critical role in adjusting the ever present tension in patent law between stimulating innovation by protecting inventors, and impeding progress by granting patents when not justified by the statutory design."[138] The patent system uses the requirements of novelty, non-obviousness, utility, enablement, definiteness, and even written description to tailor patent breadth to what the claimed invention actually contributes to its art.[139]

In fact, the patentability requirements are arguably better suited than patentable subject matter restrictions for examining technological contribution and cabining patent breadth.[140] Novelty, non-obviousness, utility, and enablement look explicitly at whether an invention contributes anything to technological progress. If an invention is already available to the public via the prior art and therefore lacks novelty, or if an invention is so readily within society's grasp that it is obvious, the invention contributes nothing to technological progress.[141] The patentability requirements thus protect

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134. *Mayo Collaborative Servs.* 132 S. Ct. at, 1297–98 (quoting Bilski v. Kappos, 130 S. Ct. 3218, 3231 (2010); Parker v. Flook, 437 U.S. 584, 590 (1978)); *Accenture Global Services, GmbH*, 728 F.3d at 1344–45 (quoting *CLS Bank Int'l*, 717 F.3d at 1282); *Ultramercial, Inc.*, 722 F.3d at 1344.

135. *Alice Corp.*, 134 S. Ct. at 2357 (quoting *Mayo Collaborative Servs.*, 132 S. Ct. at 1294); *Flook*, 437 U.S. at 594; *CLS Bank Int'l*, 717 F.3d at 1291.

136. Lemley et al., *supra* note 88, at 1330; Michael Risch, *A Suprisingly Useful Requirement*, 19 GEO. MASON L. REV. 57, 78–81 (2011) (citations omitted).

137. *Alice Corp.*, 134 S. Ct. at 2359–60 (citing *Mayo Collaborative*, 132 S. Ct. at 1297–98); *accord* Bancorp Servs. *v.* Sun Life Assurance, 687 F.3d 1266, 1279 (2012) (citing Research Corp. Techs., Inc. v. Microsoft Corp., 627 F.3d 859, 869 (Fed. Cir. 2010)).

138. *Bilski*, 130 S. Ct. at 3229; *accord* Eisenberg, *supra* note 6, at 41–42; Strandburg, *supra* note 62, at 576.

139. Burk & Lemley, *supra* note 99, 1656–57; Duffy, *supra* note 5, at 615, 623; Eisenberg, *supra* note 6, at 26–27; Lemley et al., *supra* note 88, at 1326–27; Risch, *supra* note 30, 591–93.

140. *See, e.g.*, *In re* Bilski, 545 F.3d 943, 1015 (Fed. Cir. 2008) (en banc) (Rader, J., dissenting) ("These statutory conditions and requirements better serve the function of screening out unpatentable inventions than [section 101]"); *see also* Dennis Crouch & Robert P. Merges, *Operating Efficiently Post-*Bilski *by Ordering Patent Doctrine Decision-Making*, 25 BERKELEY TECH. L.J. 1673, 1688 (2010) (explaining that "patentability doctrines are each distinct in some form, they still overlap in many, often complex, ways.").

141. *See* 35 U.S.C. §102(a) (2012) (requiring novelty); 35 U.S.C. § 103 (2012) (requiring non-obviousness).

specifically against patent claims whose contributions to their arts are limited.[142] The novelty and non-obviousness requirements also do so in a more nuanced manner by looking at the merits of each invention in relation to its relevant art;[143] patentable subject matter, by contrast, does not employ the benefit of prior art in measuring an invention's technological value.

Likewise, the patentability requirements of enablement, definiteness, and written description do a better job at narrowing patent scope and tailoring it to technological contribution.[144] The enablement requirement under section 112 requires that a patent describe the claimed invention in "such full, clear, concise, and exact terms" that a skilled practitioner in the field could use that description both to make and to use the invention.[145] A patent that enables a relatively narrow range of embodiments enjoys narrow claim scope.[146] The written description requirement, also under section 112, demands that patentees describe their claimed inventions in enough detail to prove that they technically possess the full scope of their patent claims.[147] Even the requirement of claim definiteness under section 112 protects against patent overbreadth by invalidating claims that are so vague that the boundaries of the claim cannot be determined.[148] The more specific and concrete the inventive concept, the narrower the patent on it tends to be.[149]

To some extent, patentable subject matter restrictions may overlap with the patentability requirements, and many patentable subject matter decisions use language that invokes novelty, non-obviousness, utility, and so on.[150] Indeed,

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142. *Bilski*, 130 S. Ct. at 3229; Eisenberg, *supra* note 6, at 42 (citing 35 U.S.C. §§ 102–103 (2010)); *see also* State St. Bank & Trust Co. v. Sig. Fin. Grp., Inc., 149 F.3d 1368, 1377 (Fed. Cir. 1998) ("Whether the patent's claims are too broad to be patentable is not to be judged under § 101, but rather under §§ 102, 103 and 112.").

143. *See generally* Burk & Lemley, *supra* note 99 (discussing the many ways in which a court may tailor patent law).

144. Merges & Nelson, *supra* note 69, at 848.

145. 35 U.S.C. § 112(a) (2012).

146. Chiang, *supra* note 58, at 1222; *see* Chiappetta, *supra* note 103, at 164.

147. 35 U.S.C. § 112(a); *see also* Jeremy A. Lefstin, *The Formal Structure of Patent Law and the Limits of Enablement*, 23 BERKELEY TECH. L.J. 1141, 1154–56 (2008); Michael Risch, *A Brief Defense of the Written Description Requirement*, 119 YALE L.J. ONLINE 127, 138–42 (2010) (citations omitted).

148. 35 U.S.C. § 112(b) (2012); *see also In re* Musgrave, 431 F.2d 882, 893 (C.C.P.A. 1970) (holding that claims involving subjective human judgment may be indefinite); Carl A. Kukkonen, *Be a Good Sport and Refrain from Using My Patented Putt: Intellectual Property Protection for Sports Related Movements*, J. PAT. & TRADEMARK OFF. SOC'Y 808, 823–24 (1998) (noting indefiniteness of sports method patents).

149. Lemley et al., *supra* note 88, at 1334–35. Concerns about preemptive effects on future inventors can also be addressed through means other than patentability, such as the reverse doctrine of equivalents and an experimental-use exception. *See* Burk, *supra* note 109, at 154–58 (citations omitted); Chisum, *supra* note 33, at 1017–18; Merges & Nelson, *supra* note 69, at 862 (quoting Borg-Warner Corp. v. Paragon Gear Works, 355 F.2d 400, 404 (1st Cir. 1965); Strandburg, *supra* note 62, at 596 (quoting Parker v. Flook, 437 U.S. 584, 590 (1978)).

150. *See, e.g.*, *In re* Bergstrom, 427 F.2d 1394, 1401 (C.C.P.A. 1970) (explicitly equating "new" under section 101 with novelty under section 102); Merck & Co. v. Olin Mathieson Chem.

some commentators argue that patentability requirements such as utility and novelty would serve much better than patentable subject matter restrictions to distinguish patentable from unpatentable technology.[151] As the courts have repeatedly made clear, however, patentable subject matter law looks at different factors and does different work than do the patentability requirements.[152]

Take for example, the apparent overlap between patentable subject matter and enablement. As the majority in *Bilski* mentioned, some claimed inventions such as business methods may be so vague, conceptual, and nonspecific that their bounds are inevitably broad, but their technological contributions are uncertain and vague.[153] For example, many patentable subject matter cases cite to the famous case of *O'Reilly v. Morse*, involving Samuel Morse's patent on his invention of the telegraph.[154] Morse's patent included an extremely broad eighth claim for the use of "electromagnetism, however developed for marking or printing intelligible characters, signs, or letters, at any distances," even though Morse's telegraph was clearly only one embodiment of the possible ways in which someone might use electromagnetism to send long distance messages.[155] The Supreme Court invalidated the eighth claim, explaining that it was too broad because "[Morse] claims an exclusive right to use a manner and process which he has not described and indeed had not invented," specifically citing to the enablement requirement as it existed in the 1836 Patent Act.[156] Morse's claim can therefore be fairly characterized as one that failed both patentable subject matter restrictions and the enablement requirement.

Corp., 253 F.2d 156, 164 (4th Cir. 1958) (applying only novelty and utility requirements); *see also* Efthimios Parasidis, *A Uniform Framework for Patent Eligibility*, 85 TUL. L. REV. 323, 351 (2010) (noting this phenomenon); Burton T. Ong, *Patenting the Biological Bounty of Nature: Re-Examining the Status of Organic Inventions as Patentable Subject Matter*, 8 MARQ. INTELL. PROP. L. REV. 1, 23 (2004) (same).

151. *E.g.*, Kristen Osenga, *Ants, Elephant Guns, and Statutory Subject Matter*, 39 ARIZ. ST. L.J. 1087 (2007); Risch, *supra* note 30, at 637; David Kappos, *Some Thoughts on Patentability*, Director's Forum: A Blog from USPTO's Leadership, U.S. Pat. & Trademark Off. (July 27, 2012), http://www.uspto.gov/blog/director/entry/some_thoughts_on_patentability.

152. *See* Mayo Collaborative Servs. v. Prometheus Labs., 132 S. Ct. 1289, 1303–04 (2012) (citations omitted); Diamond v. Diehr, 450 U.S. 175, 190 (1981) (quoting *In re* Bergy, 596 F.2d 952, 961 (C.C.P.A. 1979); S. Rep. No. 82-1979, at 5, 6, 17 (1952)); *Flook*, 437 U.S. at 588; *In re* Bilski, 545 F.3d 943, 958 (Fed. Cir. 2008) (en banc) (quoting *Diehr*, 450 U.S. at 188–91; *Flook*, 437 U.S. at 594); *see also* Eisenberg, *supra* note 6, 50–60 (citing 35 U.S.C. §§ 102–103, 112 (2010)) (comparing patentable subject matter restrictions with patentability requirements).

153. Bilski v. Kappos, 130 S. Ct. 3218, 3229 (2010); *see also* BESSEN & MEURER, *supra* note 115, at 56–62 (2008) (citations omitted) (noting that some types of subject matter are more prone to vague and overbroad claims); Collins, Bilski, *supra* note 6, at 50–53 (citations omitted) (same).

154. *E.g.*, *Bilski*, 130 S. Ct. at 3253 (Kennedy, J., concurring) (citing O'Reilly v. Morse, 56 U.S. (15 How.) 62, 113 (1853)); *Flook*, 437 U.S. at 592 (quoting and citing *Morse*, 56 U.S. (15 How.) at 115); Gottschalk v. Benson, 409 U.S. 63, 68 (1972) (quoting and citing *Morse*, 56 U.S. (15 How.) at 111–13).

155. *Morse*, 56 U.S. (15 How.) at 112.

156. *Id.* at 113.

The vagueness of a patent claim is a separate issue from the abstraction of its subject matter, however.[157] The former is an issue of enablement or lack therefore, whereas the latter is an issue of patentable subject matter.[158] To understand this distinction, one need only look at the number of claimed inventions—such as business methods, mathematical algorithms, and laws of nature—that are quite specific, fully enabled, and yet rejected as abstract ideas.[159] Justice Stevens' concurrence in *Bilski*, for example, noted that the risk hedging method at issue in that case was neither a vague statement of abstract principles or fundamental truths nor lacking in specificity, but was nonetheless an unpatentable abstract idea.[160] As Justice Stevens explained, "claim specification is covered by section 112, not section 101; and if a series of steps constituted an unpatentable idea merely because it was described without sufficient specificity, the Court could be calling into question some of our own prior decisions."[161] Were vagueness and ambiguity truly the defining characteristic for why abstract ideas are unpatentable, moreover, the useful, concrete, and tangible test and its sole focus on specificity and utility likely would have curried more favor.[162]

Similar analyses distinguish novelty, non-obviousness, and utility from patentable subject matter restrictions. Mathematical formulas may be both novel and useful, yet still be unpatentable laws of nature.[163] Discoveries of natural phenomena may be both novel and non-obvious, yet still be unpatentable subject matter.[164] Novelty and non-obviousness depend not only on prior art but also on the "Person Having Ordinary Skill In The Art" (PHOSITA) standard, or what a PHOSITA would find enabled by or obvious over the prior, as do the utility and enablement requirements.[165] Subject matter restrictions, by contrast, do not look

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157. Collins, Bilski, *supra* note 6, at 51–53 (quoting Nichols v. Universal Pictures Corp., 45 F.2d 119, 121 (2d Cir. 1930)) (citing Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 548 U.S. 124, 134 (2006); *Morse*, 56 U.S. (15 How.) at 113; *In re* Gorman, 933 F.2d 982, 987 (Fed. Cir. 1991)).

158. *See* Chisum, *supra* note 40, at 20 (quoting *In re* Wands, 858 F.2d 731, 737 (Fed. Cir. 1988)) (citing *Morse*, 56 U.S. (15 How.) at 62); Risch, *supra* note 30, at 600–02 (citations omitted).

159. *See, e.g.*, Mayo Collaborative Servs. v. Prometheus Labs., 132 S. Ct. 1289, 1303 (2012) (noting that the unpatentable law of nature at issue in the case was both "narrow and specific"); *see also* Collins, *supra* note 87, at 21–22 (citing 35 U.S.C. § 112(a) (2012)) (noting that disclosure doctrines do not prevent the patenting of information as abstract ideas).

160. Bilski v. Kappos, 130 S. Ct. 3218, 3235 (2010) (Stevens, J., concurring).

161. *Id.* at 3235–36.

162. *See supra* text accompanying notes 104–115.

163. Parker v. Flook, 437 U.S. 584, 585 (1978) (explaining the holding in Gottschalk v. Benson, 409 U.S. 63, 67–68 (1972)).

164. Lab. Corp. v. Metabolite Labs., Inc., 548 U.S. 124, 126–27 (2006) (Breyer, J., dissenting) (citations omitted); Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 132 (1948).

165. Burk & Lemley, *supra* note 99, at 1648–51 (quoting 35 U.S.C. § 112(a) (2012)) (citing 35 U.S.C. § 103 (2012); Graver Tank & Mfg. Co. v. Linde Air Prods. Co., 339 U.S. 605, 609 (1950); Exxon Res. & Eng'g Co. v. U.S., 265 F.3d 1371, 1376 (Fed. Cir. 2001)).

at either the prior art or the PHOSITA standard.[166] A particular piece of music, for example, is clearly unpatentable subject matter, not because the music lacks novelty or non-obviousness, analyses to which music does not lend itself in any event, but because music is simply unpatentable.[167]

In fact, patentable subject matter does not specifically look at a claimed invention's contribution to its art or at the scope of embodiments covered at all. It is the patentability requirements that measure technological value and cabin patent scope, but subject matter restrictions perform some other function.[168] Whereas novelty, non-obviousness, and the other patentability requirements are designed to weed out inventions whose progress inhibiting breadth outweighs their progress promoting contributions, the patentability requirements do not distinguish patentable inventions from unpatentable discoveries or abstract ideas.[169] To the extent that patent law excludes phenomena of nature, laws of nature, and abstract ideas from patentability—and perhaps more importantly, for whatever reasons that patent law does so—only patentable subject matter does the actual work.

In the end, patentable subject matter restrictions have little correlation with overbreadth and the risk of preemption.[170] This is not to say that preemption, patent anticommons and thickets, and other holdups are not a problem in the patent system; the point here is only that as actually applied, patentable subject matter restrictions do little to address these problems. Unlike inquiries into whether patentability requirements have been met, patentable subject matter determinations do not look at the balance between hindering and promoting technological progress when the invention is clearly within section 101's four categories of included subject matter. The courts even admit as much, acknowledging that overbreadth is the symptom, not the disease, when it comes to patentable subject matter.[171] "[P]re-emption is merely an indication that a claim seeks to cover a fundamental principle itself rather than only a specific application of that principle."[172] What distinguishes phenomena of nature from

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166. *See generally* Gerard N. Magliocca, *Patenting the Curve Ball: Business Methods and Industry Norms*, 2009 BYU L. Rev. 875, 877 (arguing that patentable subject matter ought to employ a PHOSITA-like standard for processes).

167. *In re* Alappat, 33 F.3d 1526, 1554 (Fed. Cir. 1994).

168. Eisenberg, *supra* note 6, at 8; Strandburg, *supra* note 62, at 580 (citing Dreyfuss & Evans, *supra* note 54, at 1359–61).

169. Eisenberg, *supra* note 6, at 54–56; Strandburg, *supra* note 62, at 606.

170. Strandburg, *supra* note 62, at 588. *But see* Eisenberg, *supra* note 6, at 56–61 (arguing that patentable subject matter may impose some vague restraints on claim overbreadth).

171. *Id.* at 566, 613.

172. *In re* Bilski, 545 F.3d 943, 957 (Fed. Cir. 2008) (en banc) (citing Diamond v. Diehr, 450 U.S. 175, 187 (1981); Gottschalk v. Benson, 409 U.S. 63, 71–72 (1972)); *accord* CLS Bank Int'l v. Alice Corp. Pty., 717 F.3d 1269, 1281 (Fed. Cir. 2013); Arrhythmia Res. Tech. v. Corazonix Corp. 958 F.2d 1053, 1057 (Fed. Cir. 1992); *In re* Walter, 618 F.2d 758, 767 (C.C.P.A. 1980); *see also* Strandburg, *supra* note 62, at 566 (criticizing the preemption rationale).

patentable subject matter seems to be some other, more intuitive sense of what patentable technology is.[173]

B. The Unpatentability of Knowledge and Information Rationale

Another rationale sometimes cited in patentable subject matter cases is that phenomena of nature, laws of nature, and abstract ideas are all "part of the storehouse of knowledge of all men . . . free to all men and reserved exclusively to none."[174] That is to say, phenomena of nature, laws of nature, and abstract ideas are all forms of knowledge, loosely defined, they are "scientific truths," "ideas," "principles," and "fundamental truths," and therefore not the kind of subject matter that can be patentable.[175] Professor Collins explains this as the fact that "information *qua* information" is not patentable.[176] Although applications of knowledge are patentable, knowledge and information singularly are not.[177] Knowledge may be just too important to be deemed property, as reflected in the bars on copyrighting or trademarking information and facts.[178]

Rationalizing the categories of unpatentable subject matter on the idea that knowledge and information are unpatentable is a bit of a straw man, however. It is more of an assertion than an explanation, and a rather vague assertion at that. Not everything that is unpatentable subject matter can be classified as information or knowledge strictly speaking, and things that could be classified as knowledge are patentable subject matter. It all depends on what we consider to be knowledge.

For instance, laws of nature and abstract ideas can fairly easily be characterized as types of knowledge, but phenomena of nature are a little more difficult to visualize as knowledge. Laws of nature are observable principles and precepts that define the relationships between natural forces and materials, such as Newton's law of universal gravitation or Einstein's law of special relativity;[179] mathematical algorithms are also sometimes referred to as laws of nature.[180] As the Court noted in *Prometheus*, "a patent that simply *describes* [a naturally

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173. Eisenberg, *supra* note 6, at 7; Strandburg, *supra* note 62, at 566–67 (citations omitted).

174. Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1948); *accord* Lab. Corp. v. Metabolite Labs, Inc. 548 U.S. 124, 127–28 (2006) (Breyer, J., dissenting from denial of certiorari).

175. Gottschalk v. Benson, 409 U.S. 63, 67 (1972) (quoting Mackay Radio & Tel. Co. v. Radio Corp., 306 U.S. 86, 94 (1939); Le Roy v. Tatham, 55 U.S. 156, 175 (1853); Rubber-Tip Pencil Co. v. Howard, 87 U.S. (20 Wall.) 498, 507 (1874)).

176. *See generally* Collins, *supra* note 87, at 12 (analyzing the patentability of information).

177. Diamond v. Diehr, 450 U.S. 175, 188 (1981) (quoting *Mackay Radio*, 306 U.S. at 94).

178. *See, e.g.*, Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 548 U.S. 124, 127 (2006) (Breyer, J., dissenting) (citing WILLIAM M. LANDES & RICHARD A. POSNER, THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW 305 (2003)) (noting patent law's exclusion of scientific and mathematical information as analogous to copyright's exclusion of "ideas").

179. Mayo Collaborative Servs. v. Prometheus Labs., 132 S. Ct. 1289, 1293 (2012).

180. *Diehr*, 450 U.S. at 214–15; *see also Mackay Radio*, 306 U.S. at 94 (referring to the mathematical expression at issue as a "scientific truth").

occurring] relation sets forth a natural law."[181] Likewise, the abstract idea category has been used to exclude mental processes, legal and economic theories, data, music, and other descriptive or expressive materials.[182] Most claimed inventions that have been excluded as unpatentable phenomena of nature, on the other hand, are not information about naturally occurring objects but rather the objects themselves—Rhizobium bacteria,[183] tungsten,[184] and citrus fruit,[185] for example. Genetic material clearly serves double duty as both a naturally occurring object and information,[186] but otherwise, the definition of knowledge has to be stretched a bit to accommodate phenomena of nature. A patent on an object can prevent others from studying the object, so perhaps natural phenomena are unpatentable because of the information embodied in the phenomenon itself.[187] Indeed, courts often do not distinguish between phenomena of nature and the laws of nature they embody.[188]

This latter line of reasoning argues too much, however. All patents have the potential to obstruct the study of their covered subject matter.[189] To be sure, a patent is also required to provide a written description of the claimed invention, to disclose the manner and process of making and using it, and to claim it in a way that particularly points out and distinctly claims its subject matter.[190] This required disclosure may omit a great deal of potentially useful information about the invention, however, such as how and why it works, how it might interact and be used with other technologies, how it could be developed into other technologies, and so on. Others may therefore wish to have access to the

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181. *Mayo Collaborative Servs.*, 132 S. Ct. at 1297 (emphasis added).

182. *See* MANUAL OF PATENT EXAMINING PROCEDURE § 2106.01, at 2100–17 to –18 (8th ed., rev. 2006) [hereinafter MPEP] (citations omitted); *see also* Burk, *supra* note 109, at 141–142 (citing *In re* Russell, 48 F.2d 668, 669 (C.C.P.A. 1931)) (noting that mental processes and expressive materials are unpatentable).

183. Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 131 (1948).

184. Gen. Elec. Co. v. De Forest Radio Co., 28 F.2d 641, 642 (3d Cir. 1928).

185. Am. Fruit Growers v. Brogdex Co., 283 U.S. 11–12 (1931) (citing Hartranft v. Wiegmann, 121 U.S. 609, 613, 615 (1887)). For the sake of exposition, this Article treats laws of nature and phenomena of nature as if they were distinguishable by their informational content. For example, while gravitational force can be viewed as a physical phenomenon of nature, the law of gravity can be viewed as a law of nature that defines how the gravitational force acts on objects within its reach.

186. Ass'n Molecular Pathology v. Myriad Genetics, Inc., 133 S. Ct. 2107, 2111–12, 2116–18 (2013) (citing Diamond v. Chakrabarty, 447 U.S. 303, 305, 209–10 (1980); *Funk Bros. Seed Co.*, 333 U. S. at 128–30, 132).

187. Indeed, the only way to patent some types of information about an object may be to patent the object itself. *See* Collins, *supra* note 87, at 12 (citing Eldred v. Ashcroft, 537 U.S. 186, 216 (2003)); Eisenberg, *supra* note 6, at 51–52.

188. *E.g.*, *Funk Bros. Seed Co.*, 333 U.S. at 130–31 (referring to product claim on bacteria variously as a "phenomenon of nature," "law of nature," and "natural principle"); *see also* Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 548 U.S. 124, 134, 137 (2006) (referring to natural correlation at issue alternately as both a "natural phenomenon" and a "natural law").

189. *See* Katherine J. Strandburg, *What Does the Public Get? Experimental Use and the Patent Bargain*, 2004 WIS. L. REV. 81, 102.

190. 35 U.S.C. § 112 (2012).

claimed invention itself in order to study it in more depth, but because modern U.S. patent law has an extremely limited experimental use exception, others may have to wait until patent expiration to be able to study what knowledge an invention may have to reveal.[191]

Moreover, to the extent that patents do disclose information about the claimed invention, a patent grants exclusive right over that information at least for the purposes of making, using, selling, or offering to sell the claimed invention.[192] In this limited sense, information and knowledge are patentable. Again, patents do not protect the concrete or tangible embodiments of an invention, but rather the inventive concept behind it.[193] As Professor Wagner explained in his article, "[i]n the context of intellectual property, the subject matter to be controlled is information: expression in the case of copyrights, [and] (applied) ideas in the case of patents."[194] This is particularly true for process claims, which are in effect simply step-by-step information on, and algorithms for, accomplishing a particular technological task.[195] Much of what could be considered knowledge or information is in fact patentable subject matter.[196] It is perhaps for this reason that knowledge and information are not explicit categories of exclusion.[197] If phenomena and laws of nature, or even other excluded categories, were unpatentable because they are unpatentable information and knowledge, then patentable subject matter law would presumably state up front that information and knowledge cannot be patented.

That being said, some types of information and knowledge clearly are unpatentable subject matter. Again, expressive or descriptive materials or other printed matter that performs no function has never been considered patentable subject matter.[198] The Supreme Court in *Prometheus* invalidated the claimed drug dosage adjustment method at issue as an unpatentable law of nature because it merely described the correlation between a patient's metabolite levels and the

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191. Strandburg, *supra* note 189, at 102.

192. *See* 35 U.S.C. § 154 (2012); *see also* Enzo Biochem, Inc. v. Gen-Probe, Inc., 323 F.3d. 956, 981 (Fed. Cir. 2002) (Rader, J. dissenting) (noting that competitors must wait until expiration to use patents' enabling disclosures to use, exploit, or commercialize the claimed inventions).

193. *See* Duffy, *supra* note 5, at 642 (quoting ROBINSON, *supra* note 41, § 134, at 190–91); Durham, *supra* note 41, at 843–44; Morris, *supra* note 41, at 498.

194. R. Polk Wagner, *Information Wants to Be Free: Intellectual Property and the Mythologies of Control*, 103 COLUM. L. REV. 995, 998 (2003).

195. *See, e.g.*, Diamond v. Diehr, 450 U.S. 175, 219 (1981) (Stevens, J., dissenting) (noting that almost any process can be described as an unpatentable algorithm or law of nature); *In re* Freeman, 573 F.2d 1237, 1245–46 (1978) (quoting MERRIAM-WEBSTER'S NEW COLLEGIATE DICTIONARY 28 (10th ed. 2000)) (same); Chisum, *supra* note 36, at 975 (noting broad definition of algorithms and their overlap with "processes").

196. Collins, *supra* note 87, at 11 ("The breadth or polyvalency of the concept of information suggests that many things that we currently treat as patentable, if not all of them, are also information.").

197. *Id.* at 25 (citing Eldred v. Ashcroft, 537 U.S. 186, 216 (2003)).

198. MPEP, *supra* note 182, § 2106.01, at 2100–17; *see also* Burk, *supra* note 109, at 141–42 (citing *In re* Russell, 48 F.2d 668, 669 (C.C.P.A. 1931)).

effective dose of thiopurine.[199] Furthermore, in *Gottschalk v. Benson*, the Court rejected a computerized method for converting binary coded decimal numbers into pure binary numbers as an attempt to patent a mathematical algorithm itself.[200] Basic economic or legal theories, mental activities such as observations, evaluations, or opinions, teaching concepts, and instructions for business methods have also all been held to be unpatentable types of information and knowledge.[201]

Why are these types of information unpatentable subject matter? Much of the information and knowledge rejected as unpatentable subject matter is novel, non-obvious, and quite useful.[202] Once again, much of the excluded types of information and knowledge also serve to promote significant progress in useful arts.[203] Both courts and commentators have offered a variety of reasons why certain types of knowledge and information are nonetheless unpatentable subject matter.

A number of cases fall back on the preemption argument, describing knowledge and information as "basic tools of scientific and technological work,"[204] and that patents on such knowledge would "inhibit further discovery by improperly tying up the future use."[205] This argument fails for all the reasons discussed in the previous section.[206]

A variation on the preemption argument expressed in some cases is the concern that patents on phenomena and laws of nature or abstract ideas would impede further research and acquisition of knowledge.[207] Again, this argument

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199. Mayo Collaborative Servs. v. Prometheus Labs., 132 S. Ct. 1289, 1297 (2012).

200. Gotttschalk v. Benson, 409 U.S. 63, 71 (1972).

201. MPEP, *supra* note 182, § 2106, at 2100–17; *Interim Guidance for Determining Subject Matter Eligibility for Process Claims in View of* Bilski v. Kappos, 75 Fed. Reg. 43,922, 43,926 (July 27, 2010) (citing Bilski v. Kappos, 130 S. Ct. 3218, 3224, 3229, 3230, 3231, 3248 (2010)), *available at* http://www.uspto.gov/patents/law/exam/bilski_guidance_27jul2010.pdf.

202. *Mayo Collaborative Servs.*, 132 S. Ct. at 1303 (Breyer, J., dissenting) (quoting and citing 35 U.S.C. §§ 102–103, 112 (2012)); Parker v. Flook, 437 U.S. 584, 585, 588 (1978); Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 131 (1948); *see also* Karjala, *supra* note 11, at 448–49; Dennis S. Karjala, *A Coherent Theory for the Copyright Protection of Computer Software and Recent Judicial Interpretations*, 66 U. CIN. L. REV. 53, 56–58 (1997) (noting that descriptive material is often useful).

203. *See supra* text accompanying notes 76–80; Kevin Emerson Collins, *Propertizing Thought*, 60 SMU L. REV. 317, 345–46 (2007) (quoting U.S. CONST. art. 1, § 8, cl. 8).

204. *Benson*, 409 U.S. at 67; *accord Mayo Collaborative Servs.*, 132 S. Ct. at 1301 (quoting *Benson*, 409 U.S. at 67); *Bilski*, 130 S. Ct. at 3253 (Stevens, J., concurring) (quoting *Benson*, 409 U.S. at 67); *see also* Collins, *supra* note 87, at 17 (discussing the "basic tools" rationale).

205. *Mayo Collaborative Servs.*, 132 S. Ct. at 1301; *see also* Collins, *supra* note 87, at 349 (quoting *Benson*, 409 U.S. at 71–72).

206. *See supra* Part II. A.

207. *E.g.*, Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 548 U.S. 124, 128 (2006) (Breyer, J., dissenting) (holding that such preemption might discourage development); Miriam Bitton, *Patenting Abstractions*, 15 N.C. J. L. & TECH. 153, 209 (2014) (same); Eisenberg, *supra* note 6, at 12 (quoting *Lab. Corp. of Am. Holdings*, 548 U.S. at 127) (same); Rebecca S. Eisenberg, *Proprietary Rights and the Norms of Science in Bio-Technology Research*, 97 YALE L.J. 177, 184 (1987) (same).

also fails because it argues too much and would cover both patentable and unpatentable subject matter.[208] The research argument also argues too little, as much of what are unpatentable abstract ideas—such as business methods, much computer software, and expression—cannot reasonably be considered tools or objects of scientific research.[209] And if freedom to pursue further research and further knowledge were actually a driving concern behind the patent system, it would seem logical to allow a much more robust experimental use exception than U.S. patent law currently does, regardless of the subject matter in question.[210]

A slightly more worrisome concern is that patents on knowledge and scientific fact pose the risk of involuntary infringement.[211] To the degree that phenomena of nature embody knowledge or are the objects of research into natural principles, patents on things like genes, cell lines, and proteins might lead to involuntary infringement by those who naturally possess them.[212] Mental processes patents are particularly suspect, as one cannot easily avoid infringement by remembering not to think about something.[213] Patent law demonstrates a noticeable discomfort with patenting anything that could constitute human thought: "mental processes—or processes of human thinking—standing alone are not patentable even if they have practical application."[214]

The discomfort with patenting human mental processes or elements of human biology comes with good reason. Patents on human thought or human activity and attempts to patent humans themselves constrain the freedom to think certain thoughts or perform certain activities, and as a result may contravene the First or even Thirteenth Amendments or other express guarantees of various freedoms.[215] Patenting information or knowledge may therefore be

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208. *See supra* text accompanying notes 204–06.

209. Eisenberg, *supra* note 6, at 12–13.

210. *See generally* Rebecca S. Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experiment Use*, 56 U. CHI. L. REV. 1017, 1029 (1989) (discussing the lack of an experimental-use exception in the U.S. patent system); Strandburg, *supra* note 189 (same).

211. *See* Kevin Emerson Collins, *Constructive Nonvolition in Patent Law and the Problem of Insufficient Thought Control*, 2007 WIS. L. REV. 759; Alan L. Durham, *Natural Laws and Inevitable Infringement*, 93 MINN. L. REV. 933 (2009); Andrew W. Torrance, *Neurobiology and Patenting Thought*, 50 IDEA 27 (2009).

212. *See* Collins, *supra* note 211, at 760–61; Durham, *supra* note 211, at 934–35; Torrance, *supra* note 211, at 40.

213. Collins, *supra* note 211, at 760–62 (citations omitted); Torrance, *supra* note 211, at 29; *see also* Pamela Samuelson, Benon *Revisited: The Case Against Patent Protection for Algorithms and Other Computer Program-Related Inventions*, 39 EMORY L.J. 1025, 1034–35 (1990) (outlining the mental steps doctrine).

214. *In re* Comiskey, 544 F.3d 967, 979 (Fed. Cir. 2009); *accord In re* Warmerdam, 33 F.3d 1354, 1359–60 (Fed. Cir. 1994).

215. Dan L. Burk, *The Problem of Process in Biotechnology*, 43 HOUS. L. REV. 561, 571 (2006); Margo A. Bagley, *Patent First, Ask Questions Later: Morality and Biotechnology in Patent Law*, 45 WM. & MARY L. REV. 469, 501–04 (2003) (citations omitted); Andrew W. Torrance, *Physiological Steps Doctrine*, 23 BERKELEY TECH. L.J. 1471, 1505 n.213 (2008) (citing Burk, *supra* note 109, at 139–140).

fundamentally different in the threat that it would pose to freedom of thought, particularly given patent law's strict liability regime.[216]

In *Laboratory Corp. of America Holdings v. Metabolite Laboratories, Inc.*, for example, the patentee claimed a process of diagnosing cobalamin or folate vitamin deficiencies in warm-blooded animals by observing the levels of the amino acid homocysteine in the animals' blood.[217] Metabolite Laboratories then sued LabCorp, alleging not that LabCorp's homocysteine assays themselves had infringed the claim but rather that the doctors who used the assays to diagnose vitamin deficiencies had infringed, making LabCorp secondarily liable for inducing infringement.[218] Thus, the underlying argument was that because the correlation between homocysteine and vitamin deficiency had become well known, infringement would "occur automatically in the mind of any competent physician."[219] Although LabCorp never expressly challenged the claim as unpatentable subject matter, the claim nicely illustrates the risk of involuntary infringement posed by patents on some types of information.[220]

Not all unpatentable information poses a risk of involuntary infringement, however. Many things that have been rejected as unpatentable abstract ideas—such as legal and economic methods, databases, expressive or descriptive content, and even complex mathematical algorithms—are too complex or sophisticated to be liable to automatic, involuntary thought.[221] Most people have difficulty forcing themselves to think through complicated mathematical algorithms or economic theories; involuntary thought is hardly a risk.[222] Many types of information and knowledge thus might be unintentionally infringed, but involuntary infringement is less likely.[223]

More importantly, concerns about involuntary infringement are easily circumvented. For decades, patentees have attempted to avoid the risk of involuntary infringement by limiting their patent claims on naturally occurring products to only their non-naturally occurring forms. Limiting patents to only the isolated, purified, or *in vitro* forms, for example, both narrows scope and

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216. Collins, *supra* note 211, at 761 (quoting Jurgens v. CBK, Ltd., 80 F.3d 1566, 1570 n.2 (Fed. Cir. 1996)).

217. 548 U.S. 124, 129 (2006) (Breyer, J., dissenting).

218. *Id.* at 129–30.

219. *Id.*

220. *See* Collins, *supra* note 211, at 761–62 (citing *Lab. Corp. of Am. Holdings*, 548 U.S. at 125–26); Durham, *supra* note 211, at 934–45. *But see* Torrance, *supra* note 211, at 42 (suggesting that doctors might have been able to control whether they infringe Metabolite's diagnostic method).

221. Collins, *supra* note 211, at 331 n.48. Indeed, some types of information simply cannot be processed by the human mind. *See* Richard S. Gruner, *Better Living Through Software: Promoting Information Processing Advances Through Patent Incentives*, 74 ST. JOHN'S L. REV. 977, 1038 (2000).

222. Along the same lines, perhaps someone with an eidetic memory could infringe a patent on War and Peace, but even then, "thinking" Tolstoy's famous novel would undoubtedly be subject to volitional control.

223. *See* Collins, *supra* note 211, at 763–64 (noting difference between unintentional and involuntary infringement); Torrance, *supra* note 211, at 40–41 (citations omitted) (same).

obviates the risk of involuntary infringement.[224] Likewise, limiting a claim to an algorithm or other information to only its use in conjunction with other affirmative actions, materials, or apparatuses such as computers avoids the risk of involuntary infringement.[225]

In fact, the scope limiting effects of machine or apparatus limitations led to the rejection—at least temporarily—of the mental steps doctrine.[226] The mental steps doctrine stated, in essence, that an invention distinguished from the prior art only by the addition of an algorithm or other information processing steps was unpatentable as "purely mental in character."[227] The Court of Customs and Patent Appeals (C.C.P.A.)[228] later rejected this strict stance in a case called *In re Prater*, explaining that algorithms or other information limited to a general purpose digital computer, a special purpose analog device, or their equivalents is not a mental step but in fact a machine that "quite clear[ly] . . . does not encompass the human being as the 'means' or any part thereof."[229] The mere act of thinking about information, involuntary or otherwise, cannot infringe a machine or apparatus claim.[230]

The Supreme Court never directly opined on the C.C.P.A.'s brief experimentation with the mental steps doctrine, but the Court's opinions make clear that patentable subject matter depends on much more than simply avoiding the risk of involuntary infringement. The Supreme Court's decision in *Gottschalk v. Benson* is a case in point.[231] The patent at issue claimed methods for increasing the efficiency of a digital computer with an algorithm for converting binary coded decimal numerals into pure binary numbers.[232] The PTO had rejected the methods as unpatentable mental processes,[233] but on appeal the C.C.P.A. reversed, noting that because the claims did not include implementation by the human mind, there was "no sound reason why the claims in this case should be held to be non-statutory."[234] A unanimous Supreme Court

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224. *See* Rebecca S. Eisenberg, *Re-Examining the Role of Patents in Appropriating the Value of DNA Sequences*, 49 EMORY L.J. 783, 785–86 (2000); Merges & Nelson, *supra* note 69, at 851; *see also* Utility Examination Guidelines, 66 Fed. Reg. 1,092, 1,093 (Jan. 5, 2001), *available at* http://www.uspto.gov/web/offices/com/sol/notices/utilexmguide.pdf.

225. *See In re* Benson, 441 F.2d 682, 688 (C.C.P.A. 1971); *In re* Prater, 415 F.2d 1393, 1406 (C.C.P.A. 1969).

226. Collins, *supra* note 211, at 355; Durham, *supra* note 41, at 818–20.

227. *In re* Abrams, 188 F.2d 165, 166 (C.C.P.A. 1951); *accord* Durham, *supra* note 211, at 964 (citing *In re Abrams*, 188 F.2d at 166).

228. The C.C.P.A. was the predecessor court to the Federal Circuit and was abolished by Federal Courts Improvement Act of 1982, Pub. L. No. 97-164, 96 Stat. 25 (1982).

229. *Prater*, 415 F.2d at 1406; *accord In re* Musgrave, 431 F.2d 882, 892–93 (C.C.P.A. 1970) (citing Cochrane v. Deener, 94 U.S. 780, 788 (1876)).

230. Gruner, *supra* note 221, at 1036.

231. 409 U.S. 63 (1972).

232. *Id.* at 64.

233. *In re* Benson, 441 F.2d 682, 684 (1971).

234. *Id.* at 688.

nonetheless held that the method was an unpatentable mathematical algorithm.[235] Although the Court agreed that the method had no substantial practical application outside of a digital computer—and hence no real risk of patenting human thought—it was still just an unpatentable idea.[236]

Other cases have similarly held that algorithms or other alleged mental processes are unpatentable subject matter, even when claimed only as used on a computer or other device.[237] These cases are based not on any risk of involuntary infringement or of patenting actual human thought, but rather on the a priori belief that knowledge itself is unpatentable even when stored on, or implemented through, a machine. References to human thought or mental processes are just metonymic allusions to what the courts see as the primarily informational content of these claimed inventions.[238] As the Federal Circuit explained in *Bancorp Services v. Sun Life Assurance Co.*, "the interchangeability of certain mental processes and basic digital computation [] help explain why the use of a computer in an otherwise patent ineligible process for no more than its most basic function—making calculations or computations—fails to circumvent the prohibition against patenting abstract ideas and mental processes."[239]

Perhaps the most cogent argument against patenting information and knowledge is that it violates the traditional patent bargain under which patentees receive exclusive rights over their inventions in exchange for dedicating any related information to the public.[240] In fact, many scholars argue that the patent system's most important function is not so much its grant of short term, individual rights over inventions, but the overall expansion of technological knowledge it immediately releases into the public domain.[241] The publication and eventual expiration of patents thus reflects the larger notion that knowledge,

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235. *Benson*, 409 U.S. at 71–72. Three of the Justices on the Court at the time took no part in the decision. *Id.* at 73.

236. *Id.* at 71.

237. Bancorp Servs. v. Sun Life Assurance Co., 687 F.3d 1266, 1279 (Fed. Cir. 2012); CyberSource Corp. v. Retail Decisions, Inc., 654 F.3d 1366, 1375 (Fed. Cir. 2011); *In re* Grams, 888 F.2d 835, 840–41 (Fed. Cir. 1989) (quoting *In re* Meyer, 688 F.2d 789, 794 (C.C.P.A. 1982)); *In re* Abele, 684 F.2d 902, 909 (C.C.P.A. 1982); *In re* Gelnovatch, 595 F.2d 32, 41 (C.C.P.A. 1979).

238. *See, e.g.*, *Benson*, 409 U.S. at 67; CLS Bank Int'l v. Alice Corp. Pty., 717 F.3d 1269, 1286 (Fed. Cir. 2013); *Bancorp Servs.*, 687 F.3d at 1279. *Cf.* Collins, *supra* note 211, at 791 n.96 (citing *In re* Comiskey, 554 F.3d 967, 970 (Fed. Cir. 2009)) (describing this phenomenon as the "rebirth" of the mental steps doctrine); Durham, *supra* note 211, at 969 (similar); Torrance, *supra* note 211, at 34–35 (citing *In re Comiskey*, 554 F.3d at 970) (similar).

239. *Bancorp Servs.*, 687 F.3d at 1278; *accord Benson*, 409 U.S. at 65.

240. *See generally* Collins, *supra* note 211 (arguing that patenting information violates the quid pro quo underlying the patent system); *see also* Kevin Emerson Collins, *Semiotics 101: Taking the Printed Matter Doctrine Seriously*, 85 IND. L.J. 1379, 1404 n.148 (2010) (arguing that knowledge must remain free); Eisenberg, *supra* note 224, at 795 (discussing the patenting of DNA sequence information).

241. Robert P. Merges, *Commercial Success and Patent Standards: Economic Perspectives on Innovation*, 76 CALIF. L. REV. 803, 810 (1988).

particularly scientific and technical knowledge, is not something that should be privately owned.[242]

The patent document includes two basic sections: (1) the claims, which describe the legal boundaries of the patentee's exclusive rights; and (2) the specification, which discloses a wealth of further information, including how to make and use the claimed invention, and the history of the invention and the prior art on which it builds.[243] This information is almost immediately made available to the public; eighteen months after patent applications are filed, the applications are published, regardless of whether any patent rights have or are likely to issue.[244] Publication thus gives the public notice of what the applicants hope to claim as their exclusive rights and discloses a great deal of detail about the claimed invention, even before it is patented.[245]

There is some debate as an empirical matter whether patents in fact discourage sharing of information, particularly among scientists doing basic research, and whether anyone actually uses patents as a source of technological, as opposed to legal, information.[246] Nonetheless, patents at least in theory are supposed to give the public immediate and free access to the information they contain.[247] Although the public may not use the disclosed information to make, use, sell, or offer to sell the claimed invention itself,[248] the public is free to use this information for any other purpose, including improving upon or design around the claimed invention or developing other inventions.[249] This spillover effect is part of the quid pro quo of the patent system, for it incentivizes inventors to reveal what they might otherwise have kept as trade secrets.[250] If

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242. *See* Stephen L. Carter, *Does It Matter Whether Intellectual Property Is Property?*, 68 CHI.-KENT. L. REV. 715, 718 (1993); *see also* Clarissa Long, *Information Costs in Patent and Copyright*, 90 VA. L. REV. 465, 541–42 (2004) (citing Robert P. Merges, *As Many As Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform*, BERKELEY TECH. L.J. 577, 585 (1999)).

243. 35 U.S.C. §§ 111–12 (2012).

244. 35 U.S.C. § 122(b) (2012). Publication of the application does not occur if the patent applicant has not also filed in other countries where patent applications are published eighteen months after filing. *Id.*

245. Eisenberg, *supra* note 210, at 1028–29 (citations omitted).

246. *See id.* at 1029 (citing Brenner v. Manson, 383 U.S. 519, 533–34 (1966)); Eisenberg, *supra* note 224, at 215; Lisa Larrimore Ouellete, *Do Patents Disclose Useful Information?*, 25 HARV. J.L. & TECH. 545, 555, 573 (2012); Rai, *supra* note 64, at 118.

247. *See* Collins, *supra* note 87, at 23–24 & n.44 (citing and quoting 3 DONALD D. CHISUM, CHISUM ON PATENTS § 7.01, at 7–7 (Matthew Bender ed., 2014); Strandburg, *supra* note 189, at 91 (citing Eisenberg, *supra* note 210, at 1021).

248. 35 U.S.C. § 154 (2012).

249. *See* Classen Immunotherapies, Inc. v. Biogen IDEC, 659 F.3d 1057, 1072–73 (Fed. Cir. 2011);Enzo Biochem, Inc. v. Gen-Probe, Inc., 323 F.3d 956, 981 (Fed. Cir. 2002); Slimfold Mfg. Co. v. Kinkead Indus., Inc., 932 F.2d 1453, 1457 (Fed. Cir. 1991).

250. *Classen Immunotherapies, Inc.*, 659 at 1072; *see also* Wagner, *supra* note 173, at 1009 (quoting Zvi Griliches, *The Search for R&D Spillovers*, 97 SCANDINAVIAN J. ECON. 29, 43–44 (1992); Richard C. Levin, *Appropriability, R&D Spending, and Technological Performance*, 78 AM. ECON. REV. 424, 425–26 (1988)) (discussing patent spillover effects).

the claimed invention were itself information, however, the public likely would not be able to use that information for any reason, as all "use" of the information would be infringement under Section 154 of the Patent Act.[251]

The patent bargain argument is in effect a repeat of the preemption argument and can be criticized for the same reasons.[252] If the freedom to use patent disclosures is a concern, then presumably only claims to information by itself—claims to pure information—should be unpatentable. Claims to physical embodiments of information, such as natural phenomena, or claims that contain any scope narrowing limitations at all, such as storage on a computer readable medium or field of use restrictions, would not violate the patent bargain. For example, patents on DNA do not violate the patent bargain; even though the patents would preclude others from making or using the physical DNA molecules themselves, others would still be free to use the genetic information encoded in those DNA molecules as a public domain spillover.[253]

Indeed, very little of what is currently classified as unpatentable phenomena of nature, laws of nature, or abstract ideas is purely just information in a way that violates the patent bargain. The claims at issue in *Mayo Collaborative Services v. Prometheus Laboratories* and *Laboratory Corp. of America Holdings v. Metabolite Laboratories, Inc.* might seem to fall into the category of pure information, as both claims comprised almost nothing other than information that certain specified levels of chemicals in the body correlate with particular medical states.[254] Even the *LabCorp* and *Prometheus* claims contained additional limitations, however. Others, therefore, still had free use of the claimed correlations as long as they did not take the additional affirmative steps of assaying homocysteine levels or administering thiopurines.[255] The Supreme Court Justices nonetheless felt that both claims were unacceptable attempts to patent laws or phenomena of nature.[256]

That being said, one could argue, of course, that the suspect claims in *LabCorp* and *Prometheus*, as well as *Benson*, had value only because of the information they contained and that this information had no other value outside of the claimed applications.[257] Allowing patents on these claims would therefore

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251. *See* Bitton, *supra* note 207, at 212; Collins, *supra* note 211, at 359 (citing Eisenberg, *supra* note 210, at 794–95).

252. *See supra* Part III.A.

253. Rebecca S. Eisenberg, *Molecules v. Information: Should Patents Protect Both?*, 8 B.U. J. SCI. & TECH. L. 190, 197–99 (2002).

254. Mayo Collaborative Servs. v. Prometheus Labs., 132 S. Ct. 1289, 1295 (2012) (claiming blood thiopurine levels correlate with treatment efficacy); Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 548 U.S. 124, 129 (2006) (claiming body homocysteine levels correlate with cobalamin or folate deficiency).

255. *Mayo Collaborative Servs.*, 132 S. Ct. at 1294; *Lab. Corp. of Am. Holdings*, 548 U.S. at 130.

256. *Mayo Collaborative Servs.*, 132 S. Ct. at 1294; *Lab. Corp. of Am. Holdings*, 548 U.S. at 135.

257. Gottschalk v. Benson, 409 U.S. 63, 63 (1972).

effectively preempt all use of the claimed correlations, any additional limitations notwithstanding. This more limited version of the preemption argument also fails, however, as the same can be said of many claims to patentable uses of information.

Compare, for example, the claims at issue in *Diamond v. Diehr*[258] and *Parker v. Flook*.[259] Both cases involved claimed methods that distinguished themselves from the prior art by novel uses of mathematical algorithms.[260] In *Diehr*, the claimed invention was a more precise method for calculating rubber curing times using the prior art Arrhenius equation.[261] *Flook* involved a more precise method for calculating alarm limits during hydrocarbon catalysis using a novel equation.[262] *Diehr*'s claim added a number of prior art steps, including installing rubber in the curing press, closing the press, and constantly measuring the temperature in the press.[263] *Flook*'s claimed process also included a number of prior art steps, such as constantly measuring temperature, pressure, flow rates, and adjusting alarm limits.[264] One important difference between the two claimed methods, however, is that *Diehr*'s claimed mathematical algorithm had value only for the claimed applications because the Arrhenius equation was developed specifically for calculating rubber curing times.[265] *Flook*'s equation, on the other hand, had been developed specifically for calculating alarm limits, but apparently could be used outside of hydrocarbon catalysis.[266] In terms of relative preemptive scope then, *Diehr*'s claim was arguably far more preemptive than *Flook*'s. To the degree that either claim threatened to violate the patent bargain, surely *Diehr* posed more of a threat than did *Flook*.

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258. 450 U.S. 175, 177–79 (1981).

259. 437 U.S. 584, 594 (1978).

260. *Diehr*, 450 U.S. at 177–79; *Flook*, 437 U.S. at 594; *see also Mayo Collaborative Servs.*, at 1298–1300 (citing *Diehr*, 450 U.S. at 177–79, 187, 192 n.14; *Flook*, 437 U.S. at 585–87, 590, 594) (comparing *Diehr* and *Flook*).

261. *Diehr*, 450 U.S. at 177–79. It is somewhat difficult to tell from the Court's opinion what the exact point of novelty was in Diehr's claimed method. The dissent clearly felt that the method's novelty lay in its use of a digital computer to calculate rubber-curing times, *id.* at 206–09 (Stevens, J., dissenting) while the majority seemed at one point to suggest that the method's novelty lay in its continuous measurement of temperatures inside the curing press, *id.* at 178. The majority's opinion did not depend on the novelty *vel non* of continuously measuring press temperatures, however, and both the PTO and the C.C.P.A. seemed to view the method's novelty as lying solely in its use of the Arrhenius equation to calculate cure times. *Id.* at 207–08.

262. *Flook*, 437 U.S. at 585–86, 594.

263. *Diehr*, 450 U.S. at 184. In this regard, the Court gave an arguably liberal interpretation to claims 1 and 2 of Diehr's patent application, as neither of those claims directly stated a "physical and chemical process" for curing rubber other than the operation of a rubber molding press. *See id.* at 179. Nonetheless, the Court apparently viewed those claims as describing the entire rubber molding process rather than just the calculation step of the process. *Id.* at 184.

264. *Flook*, 437 U.S. at 585; *In re* Flook, 559 F.2d 21, 22 (C.C.P.A. 1977).

265. *Diehr*, 450 U.S. at 177 n.2.

266. *Flook*, 437 U.S. at 586, 589–90.

Nevertheless, the Supreme Court found *Diehr*'s claim to be a patentable process, but found *Flook*'s claim to be an unpatentable mathematical formula.[267] Although the Court in each case seemed to focus on the relative scope of the claims,[268] what ultimately proved dispositive in each case seems to have little to do with the patent bargain or preempting use of information. As the Court explained in both decisions, "a process is not unpatentable simply because it contains a law of nature or a mathematical algorithm."[269] Instead, the Court seemed much more intent on the nature of the additional steps in each case, finding that *Diehr*'s invention as a whole constituted an application of a law of nature, but that *Flook*'s invention, even when considered as a whole, "contain[ed] no patentable invention."[270] Similarly, the *Benson* Court based its rejection on the concern that the computerized method at issue there would cover both known and unknown "end uses" of the algorithm.[271] The Court never defined what it meant by end use, instead suggesting that transformation and reduction of an article to a different state or thing might be an end use, but then denying that such transformation was necessary for patentability.[272] Once again, the Court explains that a claimed invention must constitute an "end use," "inventive application," or "inventive concept" to be patentable subject matter were seen,[273] but the Court once again provided no definition of what those terms mean other than "we know it when we see it."[274]

A final possible rationale for excluding information and knowledge as unpatentable subject matter is the need to distinguish patent from other forms of intellectual property.[275] Copyright, trademark, and trade secrecy are all designed to achieve different goals than those of patent law, and each type of protection has a different term of duration, rights of exclusivity, analyses for infringement, and requirements for eligibility, including subject matter restrictions.[276] A lack of clear distinctions between the types of subject matter protected under each intellectual property regime could lead to a number of problems, including administrative costs and increased search and examination costs, as well as a lack of uniformity, reducing the value of intellectual property protections

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267. *Diehr*, 450 U.S. at 192–93; *Flook*, 437 U.S. at 594.

268. *Diehr*, 450 U.S. at 187; *Flook*, 437 U.S. at 586.

269. *Diehr*, 450 U.S. at 187 (quoting *Flook*, 437 U.S. at 590).

270. *Diehr*, 450 U.S. at 187; *Flook*, 437 U.S. at 594.

271. Gottschalk v. Benson, 409 U.S. 63, 68 (1972).

272. *Id.* at 68, 70–71.

273. *See supra* text accompanying notes 144–49.

274. Collins, Bilski, *supra* note 6, at 39.

275. *See generally* Michael J. Madison, *Beyond Invention: Patent as Knowledge Law*, 15 LEWIS & CLARK L. REV. 71 (2011) (tracing historical distinctions between patentable and copyrightable subject matter).

276. Patent law is generally characterized as having more stringent qualification requirements and a shorter term of protection but stronger rights once protection is granted. Copyright and trademark law, by contrast, offer much "thinner" rights of exclusivity but for longer periods with less stringent qualification criteria. Karjala, *supra* note 11, at 462; Glynn S. Lunney, Jr., Lotus v. Borland*: Copyright and Computer Programs*, 70 TUL. L. REV. 2397, 2420 n.70 (1996).

generally.[277] Perhaps information, knowledge, and expression are protected under the patent system because they may be otherwise protectable under copyright, trademark, or trade secrecy.

Take for example the differences between copyrightable and patentable subject matter. Copyright law stems from the same clause of the Constitution as patent law, but rather than granting to inventors the exclusive right to their discoveries "[t]o promote the progress of useful arts, [copyright law grants] 'Authors' the exclusive right to their 'Writings' to promote the progress of 'Science.'"[278] Science refers not to what modern language would call science, but to knowledge, learning, art, and the liberal arts more generally.[279] Allowing patents on information, knowledge, expression, or other abstract ideas might therefore violate the constitutional division between the copyright and patent systems.[280]

That being said, much of what falls outside of patentable subject matter boundaries also falls well outside of the boundaries of copyright and trademark protection.[281] The gap between these types of protections is so large that it encompasses a good deal of valuable subject matter that can be protected only through trade secrecy, if at all.[282] Functional ideas and principles such as mathematical algorithms and laws of nature are neither patentable nor

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277. *See* TrafFix Devices, Inc. v. Mktg. Displays, Inc., 532 U.S. 23, 29, 34–35 (2001); *see also* Chiang, *supra* note 58, at 1234–35 (citing Dennis D. Crouch, *The Patent Lottery: Exploiting Behavioral Economics For the Common Good*, 16 GEO. MASON L. REV. 141, 150 (2008); Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 NW. U. L. Rev. 1495, 1497 (2001)) (discussing the general cost/benefit ratio of the patent system); Eisenberg, *supra* note 6, at 48 (citing Brian Kahin, *Patents and Diversity in Innovation*, 13 MICH. TELECOMM. & TECH. L. REV. 389 (2007)) (discussing differences in cost regarding patent reform); *see generally* Glynn S. Lunney, Jr., *Patent Law, the Federal Circuit, and the Supreme Court: A Quiet Revolution*, 11 S. CT. ECON. REV. 1 (2004) (arguing that relaxing patentability standards effectively will require lowering patent strength).

278. U.S. CONST. art. 1, § 8, cl. 8.

279. *See In re* Alappat, 33 F.3d 1526, 1552 (Fed. Cir. 1994) (Archer, J., dissenting) (citing CHISUM, *supra* note 33, §1.01, at 1-8 n.14); *see generally* Coulter, *supra* note 8 (distinguishing science from the useful arts); *Lutz, supra* note 19 (same); *Walterscheid, supra* note 19 (same).

280. *See, e.g.*, Karjala, *supra* note 11, at 448–52 (citations omitted) (discussing distinctions between patentable and copyrightable subject matter); *see also* Collins, *supra* note 87, at 13 (discussing "information qua information).

281. Karjala, *supra* note 11, at 471–72 (citing Wendy J. Gordon, *On Owning Information: Intellectual Property and the Restitutionary Impulse*, 78 VA. L. REV. 149, 277 (1992); Richard H. Stern, *Scope of Protection Problems With Patents and Copyrights on Methods of Doing Business*, 10 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 105, 153 (1999)).

282. Trade secrecy can be used to protect anything that would otherwise qualify as patentable subject matter, as well as a great deal of subject matter that would not, such as computer software. David W. Carstens, *Legal Protection of Computer Software: Patents, Copyrights, and Trade Secrets*, 20 J. CONTEMP. L. 13, 65 (1994). As such, trade secrecy is typically seen as an alternative to patent protection, rather than a completely disparate form of protection. Shubha Ghosh, *Patents and the Regulatory State: Rethinking the Patent Bargain Metaphor After* Eldred, 19 BERKELEY TECH. L.J. 1315, 1337 (2004) (citing Kewanee Oil Co. v. Bicorn Corp., 416 U.S. 470, 474–84 (1974).

copyrightable, and even expressive concepts such as scènes à faire and artistic genres cannot be protected under either system.[283] In other words, much of what copyright law considers unprotectably functional is nonetheless not functional or useful enough to be protectable under patent law.[284]

Much the same analysis applies to trademark law as well. Trademark law is designed to reduce consumer search costs by protecting words, names, symbols, and devices that distinguish goods and services and identify their source.[285] Trademark law's core purpose is thus to improve the quality of information in the marketplace.[286] Trademark law thus does allow protection of, and in point of fact is designed to protect source-identifying information, but other types of descriptions and information are not protectable as trademarks.[287]

Specifically, trademark law prohibits protection of functional subject matter, but like copyright law defines functionality very differently from the way that patent law defines it in many cases.[288] On the one hand, trademark's functionality doctrine serves to prevent the use of trade dress protection to acquire exclusivity of potentially unlimited duration over previously patented inventions.[289] "The Lanham Act does not exist to reward manufacturers for their innovation in creating a particular device; that is the purpose of the patent law and its period of exclusivity."[290] Trademark's functionality doctrine goes far beyond simply excluding patentable functional devices, however. Functionality under trademark law also bars protection of any feature that is merely "essential to the use or purpose of the article or if it affects the cost or quality of the article[,] . . . the exclusive use of [which] would put competitors at a significant *non-reputation-related* disadvantage."[291] Courts have accordingly barred trademark protection for colors, clothing designs, and even certain words if they are considered necessary for competitors to describe their own goods and services or to compete as to cost and quality.[292] None of these would ever be

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283. 17 U.S.C. § 102(b) (2012) ("In no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery . . . ."); *see also* Stern, *supra* note 281, at 153 (noting examples of uncopyrightable subject matter).

284. Karjala, *supra* note 11, at 448–51 (citations omitted).

285. 15 U.S.C. § 1127 (2012).

286. Mark P. McKenna, *The Normative Foundations of Trademark Law*, 82 NOTRE DAME L. REV. 1839, 1840 (2007).

287. 15 U.S.C. § 1052(e) (2012); *see generally* Mary LaFrance, *Initial Impressions: Trademark Protection for Abbreviations of Generic or Descriptive Terms*, 45 AKRON L. REV. 201, 239 (2012) (discussing trademarkable subject matter).

288. RESTATEMENT (THIRD) OF UNFAIR COMPETITION § 17 cmt. a (1995).

289. Two Pesos, Inc. v. Taco Cabana, Inc., 505 U.S. 763, 775 (1992).

290. TrafFix Devices, Inc. v. Mktg. Displays, Inc., 532 U.S. 23, 34 (2001).

291. *Id.* at 32 (quoting Qualitex Co. v. Jacobson Prods. Co., 514 U.S. 159, 165 (1995)) (emphasis added).

292. *Id.* at 33 (citing *Qualitex Co.*, 514 U.S. at 165; Inwood Laboratories, Inc. v. Ives Laboratories, Inc., 456 U.S. 844, 850 n.10 (1982)); RESTATEMENT (THIRD) OF UNFAIR COMPETITION §§ 14, 15, 17 (1995) (discussing functionality); Mark P. McKenna, *(Dys)Functionality*, 48 HOUS. L. REV. 823, 848–49 (2011) (citations omitted).

considered patentable subject matter, nor are they protectable as trademarks.[293] If avoiding overlap with other intellectual property regimes were the goal of patentable subject matter restrictions, then patent protection could be much broader and more encompassing than it is.

On the other hand, as the bounds of protectable subject matter under each area of intellectual property has expanded, the lines between each have begun to blur, particularly with the advent of computer software and the Information Age.[294] For most of history, the distinctions between each form of intellectual property were relatively simple.[295] Patents protected only functional creations, while copyright and trademark protected purely nonfunctional expression and source-identifying marks, respectively.[296] Computer software spans the divide between copyright and patent and is often eligible for protection under both regimes, particularly where the line is fuzzy as between the expressive and functional elements of the software.[297] Even the line between trademark and patent has blurred somewhat due to increasing efforts to use potentially patentable product configurations as source identifiers.[298] Thus, if avoiding overlap with other intellectual property regimes were a goal of the patent system, the system has not been particularly successful.

Why information, whether in the form of laws of nature, abstract ideas, or even phenomena of nature, is unpatentable subject matter is unclear. Scientific and technological information and knowledge obviously can serve to promote technological progress, and yet the patent system staunchly refuses to allow patents on information[299] even though such patents would not preempt future invention or research, would pose no risk of involuntary infringement, or threaten to violate the patent bargain. Whether or not information itself should be patentable is not a question to be answered here, however. The main point is

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293. *See generally* McKenna, *supra* note 286 (discussing the functionality doctrine in trademark).

294. Bitton, *supra* note 207, at 157–58; *see* Karjala, supra note 11, at 442; Madison, *supra* note 275, at 100–04 (citations omitted).

295. Karjala, *supra* note 11, at 440–41 (citations omitted).

296. *Id.* at 442, 449; Lunney, *supra* note 276, at 2398 (quoting U.S. CONST. art. 1, § 8, cl. 8); *see also* Lloyd L. Weinreb, *Copyright for Functional Expression*, 111 HARV. L. REV. 1149, 1152 (1998). Functionality under copyright law means "as a practical matter[,] indispensable, or at least standard, in the treatment of" the work's ideas. Lunney, *supra* note 276, at 2402 (quoting Atari, Inc. v. N. Am. Philips Consumer Elecs. Corp. 672 F.2d 607, 616 (7th Cir. 1982); *accord* Pamela Samuelson, *Questioning Copyrights in Standards*, 48 B.C.L. REV. 193, 217–18 (2007)

297. Burk, *supra* note 99, at 100–01; 1 MELVILLE B. NIMMER & DAVID NIMMER, NIMMER ON COPYRIGHT, § 2.19, at 2-211 (2014).

298. Timothy R. Holbrook, *Patents, Presumptions, and Public Notice*, 86 IND. L.J. 779, 813–15 (2011) (quoting TrafFix Devices, Inc. v. Mktg. Displays, Inc., 532 U.S. 23, 29–30 (2001)) (citing Walmart Stores, Inc. v. Samara Bros., Inc., 529 U.S. 205, 212–13 (2000)); Madison, *supra* note 249, at 100 (citing *Walmart Stores, Inc.*, 529 U.S. at 207, 212–14).

299. *See* Eisenberg, *supra* note 210, at 196.

that information seems to be unpatentable subject matter for no other reason than that it is just not what the patent system views as patentable technology.[300]

C. The "Discovery" Versus "Invention" Rationale

One final rationale for patentable subject matter restrictions often cited by the courts is the distinction between inventions from discoveries.[301] An invention is a human-made phenomenon and "the product of human ingenuity,"[302] while discoveries are the products of natural forces and exist and act "'independently of any effort of the patentee.'"[303] Only inventions are patentable subject matter;[304] discoveries are "of course" unpatentable.[305] Accordingly, as the Supreme Court explained in *Diamond v. Chakrabarty*, the relevant distinction for purposes of section 101 is "between products of nature . . . and human-made inventions."[306] Human involvement also helps explain what the courts mean when they refer to inventive concepts or "applications." Phenomena of nature and laws of nature are not inventive concepts or applications, and therefore are not patentable subject matter because they are merely discovered, not created through human effort.[307]

At first glance, this distinction between discoveries and inventions seems to make sense on both a constitutional and a practical level. If the Constitution restricts patent protections to only the "useful Arts," human invention may be a constitutional requirement, for the term "Art" is defined as the exercise of human skill, as distinguished from nature.[308] Further, if the patent system is designed to incentivize progress in useful Arts, logically that incentive can have effect only by influencing human inventive activities, not naturally occurring phenomena and laws.

Closer inspection suggests an alternative view. Many laws and phenomena of nature require significant investments of human ingenuity to identify and

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300. *See id.*; Gruner, *supra* note 221, at 1031–32.

301. Diamond v. Chakrabarty, 447 U.S. 303, 309 (1980); Parker v. Flook, 437 U.S. 584, 593 (1978); Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U. S. 127, 131–32 (1948) (citing Cuno Eng'g Corp v. Automatic Devices Corp., 314 U.S. 84, 90–91 (1941)); CLS Bank Int'l v. Alice Corp. Pty., 717 F.3d 1269, 1283 (Fed. Cir. 2013) (quoting *Flook*, 437 U.S. at 593 n.15).

302. *Charkrabarty*, 447 U.S. at 309.

303. *Id.* at 310 (quoting *Funk Bros. Seed Co.*, 333 U.S. at 131).

304. Mayo Collaborative Servs. v. Prometheus Labs., 132 S. Ct. 1289, 1293 (2012); Bilski v. Kappos, 130 S. Ct. 3218, 3230 (2010) (citing *Flook*, 437 U.S. at 589–90).

305. *Funk Bros. Seed Co.*, 333 U.S. at 130 (emphasis added); *accord Chakrabarty*, 447 U.S. at 309; *see generally* Sarnoff, *supra* note 64 (analyzing the history behind the distinction between "discoveries" and "inventions").

306. *Chakrabarty*, 447 U.S. at 313.

307. *Mayo Collaborative Servs.*, 132 S. Ct. at 1294; *Chakrabarty*, 447 U.S. at 309; *Flook,* 437 U.S. at 594; CLS Bank Int'l v. Alice Corp. Pty., 717 F.3d 1269, 1283 (Fed. Cir. 2013) (quoting *Flook*, 437 U.S. at 593 n.15).

308. Definition of *Art*, DICTIONARY.COM, http://dictionary.reference.com/browse/art (last visited August 27, 2014).

discover.[309] As Justice Breyer observed in his dissenting opinion in *Laboratory Corp. Holdings v. Metabolite Laboratories, Inc.*:

> The justification for [excluding discoveries] does not lie in any claim that 'laws of nature' are obvious, or that their discovery is easy, or that they are not useful. To the contrary, research into such matters may be costly and time consuming; monetary incentives may matter; and the fruits of those incentives and that research may prove of great benefit to the human race.[310]

And given that discoveries can be quite valuable in promoting technological progress, patenting discoveries arguably comports with the Constitution's mandate that the patent system promotes progress in useful arts.[311] Nor is it clear that the Constitution requires that the patent system cover only inventions and not discoveries. The Constitution states that Congress may grant inventors exclusive rights in their "Discoveries,"[312] and along the same lines, section 101 of the Patent Act states that "whoever invents or discovers [a] new and useful process, machine, manufacture, or composition of matter" may be granted a patent.[313] Textually speaking then, the law could be read to allow patents on both inventions and discoveries. The patent system has never interpreted either the Constitution or section 101 this way, however.

The preemption argument is the most common justification given for excluding discoveries, but other justifications exist as well. One possible rationale for reading section 101 as disallowing patents on discoveries is that discoveries neither warrant nor benefit from patenting.[314] Discoveries of laws or phenomena of nature are often the result of pure or basic research, as opposed to applied research.[315] Basic research is often characterized as the pursuit of upstream knowledge that itself has no commercial value until developed further into downstream applications.[316] Those who pursue basic research therefore are sometimes thought to do so purely for the sake of knowledge, not market based

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309. *See* Bitton, *supra* note 207, at 208–09.

310. 548 U.S. 124, 126 (2006) (Breyer, J. dissenting); *accord* Durham, *supra* note 211, at 953–54 (citing Dickey-John Corp. v. Int'l Tapetronics Corp., 710 F.2d 329, 348 n.9 (7th Cir. 1983)).

311. *See generally* Yu, *supra* note 59, at 394 (arguing that patentable subject matter restrictions should focus more on what promotes innovation rather than on false distinctions between "discoveries" and "inventions").

312. U.S. CONST. art. I, § 8, cl. 8.

313. 35 U.S.C. § 101 (2012).

314. *See* Alan Devlin & Neel Sukhatme, *Self-Realizing Inventions and the Utilitarian Foundation of Patent Law*, 51 WM. & MARY L. REV. 897, 904 (2009).

315. *See id.*

316. *See* LANDES & POSNER, *supra* note 158, at 306; Rebecca S. Eisenberg & Robert P. Merges, *Opinion Letter as to the Patentability of Certain Questions Associated with the Identification of Partial cDNA Sequences*, 23 AIPLA Q.J. 1, 19–20 (1995); Rai, *supra* note 64, at, 133–34.

gain.[317] To the extent scientists exact returns from their basic research, they are thought to do so in the noncommercial form of publication, promotion, and respect.[318] Moreover, because its market value is often uncertain and remote, basic research is commonly funded through government and private grants *ex ante*, not *ex post* through patent licensing or royalties.[319] Because the patent system is designed to incentivize investments in research and development, discoveries already incentivized by other means and funded through government grants presumably should not be patentable.[320] The incentive effect of a patent for such discoveries would be attenuated at best, and probably redundant.[321]

This line of reasoning oversimplifies things a bit, however. While many discoveries may result from government funded basic research, others result from privately funded investments in marketable applications.[322] The line between applied research and basic research has blurred as industries and universities have come to realize the value of research as itself a form of business.[323] Many discoveries about nature can be commercially exploited almost immediately; correlations regarding metabolite and vitamin blood levels, genes that predict heightened cancer risks, and bacterial crop inoculants were all considered phenomena or laws of nature, but all had immediate market value.[324] Patents on these discoveries could therefore have been quite valuable and provided a strong incentive for investing in the basic research necessary to make these discoveries. As a policy matter then, the patent system's incentive effect might be more useful for some types of unpatentable discoveries than it is for many types of patentable inventions.[325]

Debates over the necessity or efficiency of patent incentives are not limited to discoveries of natural laws and phenomena, furthermore. Similar arguments have been made that abstract ideas such as business methods and some computer software do not need patent incentives because their research and development costs are low, or because first mover advantages, network effects, and other non-

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317. Devlin & Sukhatme, *supra* note 314, at 925–26.

318. *Id.*; *see* Durham, *supra* note 211, at 953.

319. *See generally* Brett M. Frischmann, *Innovation and Institutions: Rethinking the Economics of U.S. Science and Technology Policy*, 24 VT. L. REV. 347, 376–79 (2000) (quoting U.S. CONST. art. I, § 8, cl. 8) (discussing market failures in funding basic research).

320. LANDES & POSNER, *supra* note 158, at 306.

321. *See* Devlin & Sukhatme, *supra* note 314, at 925–27.

322. Bitton, *supra* note 207, at 203 (citing LANDES & POSNER, *supra* note 158, at 306–07); Eisenberg, *supra* note 224, at 1017–18)

323. Eisenberg, *supra* note 210, at 1017–18; Laura Pedraza-Farina, *Patent and the Sociology of Innovation*, 2013 WIS. L. REV. 813, 855 (quoting and citing STEVEN SHAPIN, THE SCIENTIFIC LIFE: A MORAL HISTORY OF A LATE MODERN VOCATION 2–3, 18–19, 97–98 (2008)).

324. *See* Mayo Collaborative Servs. v. Prometheus Labs., 132 S. Ct. 1289, 1295–96 (2012); Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 548 U.S. 124, 128 (2006) (per curiam) (Breyer, J., dissenting); Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U. S. 127, 130 (1948).

325. Durham, *supra* note 211, at 953–54 (citing Dickey-John Corp. v. Int'l Tapetronics Corp., 710 F.2d 329, 348 n.9 (7th Cir. 1983)); Sarnoff, *supra* note 64, at 57–58.

patent incentives and advantages are more than adequate.[326] Focusing on whether patents are needed to incentivize discoveries glosses over the fact that whether the patent system truly provides any incentives at all, even for inventions clearly within the strictures of patentable subject matter, is a matter still up for debate.[327] No one knows if patents, in fact, can incentivize basic research and discovery and, if so, whether those incentives would be efficient.[328] Using the patent system to channel inventive resources into innovative business methods could very well be more efficient than channeling them solely toward other subject matter that is considered more technological.[329] The indeterminacy of these questions is perhaps why patentability has never specifically relied on questions of how much research and development investment went into the claimed invention or what kind of returns that investment could earn outside of the patent system.[330] Patentable subject matter is not a question of incentives, and courts have even said as much.[331]

Another possible explanation for patent law's distinction between discoveries and inventions is more subtle and only hinted at in the case law. In referring to unpatentable subject matter, the courts sometimes use language that suggests that allowing patents on laws and phenomena of nature, and even abstract ideas, violates fundamental moral or ethical beliefs in some way. Discoveries are "manifestations of . . . nature, free to all men and reserved exclusively to none. He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes."[332]

Moreover, discomfort with the ethical implications of patenting certain types of subject matter extends to many things that are clearly human-made and not

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326. *See, e.g.*, Rochelle Cooper Dreyfuss, *Are Business Method Patents Bad for Business?*, 16 SANTA CLARA COMPUTER & HIGH TECH. L.J. 263, 274–76 (2000) (arguing business methods do not need patent incentives); Samuelson, *supra* note 213, at 1142–43 (discussing software innovation).

327. *See* Chiang, *supra* note 58, at 1239 (citing Louis Kaplow, *The Patent-Antitrust Intersection: A Reappraisal*, 97 HARV. L. REV. 1813, 1844 (1984)); Duffy, *supra* note 5, at 619–20; Eisenberg, *supra* note 6, at 45. *But see* Olson, *supra* note 10 (arguing that one can set patentable subject matter restrictions to include only innovations that would not have arisen without patent incentives).

328. Eisenberg, *supra* note 6, at 49.

329. LANDES & POSNER, *supra* note 158, at 23 n.19.

330. Devlin & Sukhatme, *supra* note 314, at 902 (citing Michael A. Carrier, *Cabining Intellectual Property Through a Property Paradigm*, 54 DUKE L.J. 1, 32, 33 & n.123 (2004); Ramsey Hanna, Note, *Misusing Antitrust: The Search for Functional Copyright Misuse Standards*, 46 STAN. L. REV. 401, 425–26 (1994)); Eisenberg, *supra* note 6, at 49.

331. Mayo Collaborative Servs. v. Prometheus Labs., 132 S. Ct. 1289, 1305 (2012); Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 548 U.S. 124, 127–28 (2006) (Breyer, J., dissenting) (quoting Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1948)); *see also* Erica L. Anderson, Note, *Finding a "Fit:" Gene Patents and Innovation Policy*, 4 HASTINGS SCI. & TECH. L.J. 357, 374–77 (2012) (citations omitted) (noting Supreme Court's reluctance to fine-tailor patentable subject matter based on incentives).

332. *Funk Bros. Seed Co.*, 333 U.S. at 130; *accord* Diamond v. Chakrabarty, 447 U.S. 303, 309 (1980); Gottschalk v. Benson, 409 U.S. 63, 67 (1972)

discoveries. Not all unpatentable subject matter is a law or phenomena of nature, of course. Legal and economic theories, data, music and literature, and even human activity itself in the form of mental activity, human behavior, and interpersonal interactions and relationships are unpatentable as abstract ideas even though they are clearly the product of human intervention.[333] Like the prohibition on patenting discoveries, the prohibition against patenting abstract ideas is nevertheless often phrased in deontological terms.[334] Abstract ideas have also been described as "part of the storehouse of knowledge of all men . . . free to all men and reserved exclusively to none."[335] "In other words, the patent statute does not allow patents on particular systems that depend for their operation on human intelligence alone, a field of endeavor that both the framers and Congress intended to be beyond the reach of patentable subject matter."[336]

Perhaps, then, the categories of excluded subject matter are founded not so much on economic or pragmatic concerns, but on moral and ethical ones.[337] References to social mores appear in various places in patent law. Natural laws and phenomena have been described as the products of divine rather than human intervention. "After all, God or Allah or Jahveh or Vishnu or the Great Spirit provided these laws and phenomena as humanity's common heritage."[338] Socially valuable human activities such as medical and surgical procedures enjoy some exemptions from patent infringement liability for what seem to be purely ethical rather than practical reasons.[339] Several commentators have protested that sports method patents are contrary to the ethos of competition based on personal skill, not patented technique.[340] Most recently, the Leahy-Smith

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333. *See Interim Guidance*, *supra* note 216, at 43,296; Chisum, *supra* note 33, at 980–84 (quoting Gottschalk v. Benson, 409 U.S. 63, 67 (1972)); Richard S. Gruner, *Intangible Inventions: Patentable Subject Matter for an Information Age*, 35 LOY. L.A. L. REV. 355, 373 (2002) (quoting John R. Thomas, *The Post-Industrial Patent System*, 10 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 3, 34–35 (1999)).

334. *See generally* Sarnoff, *supra* note 64, at 84–90 (citations omitted) (discussing religious origins of prohibiting patents).

335. *Bilski*, 130 S. Ct. at 3225 (quoting *Funk Bros. Seed Co.*, 333 U.S. at 130).

336. *In re* Comiskey, 554 F.3d 967, 980 (Fed. Cir. 2009); *accord Benson*, 409 U.S. at 67.

337. *See generally* Linda J. Demain & Aaron Xavier Fellmeth, *Reinventing the Double Helix: A Novel and Nonobvious Reconceptualization of the Biotechnology Patent*, 55 STAN. L. REV. 303, 434–35 (2002) (citations omitted) (discussing human rights and dignity implications of gene patenting); Sarnoff, *supra* note 64, at 84–90 (similar).

338. *In re* Bilski, 545 F.3d 943, 1013 (Fed. Cir. 2008) (en banc) (Rader, J., dissenting); *accord* Sarnoff, *supra* note 64, at 85 (quoting and citing JOHN LOCKE, TWO TREATIES OF GOVERNMENT § 26, at 328 (1689)).

339. Cynthia M. Ho, *Patents, Patients, and Public Policy: An Incomplete Intersection at 35 U.S.C. § 287(c)*, 33 U.C. DAVIS L. REV. 601, 634–45 (2000) (quoting 35 U.S.C. § 287(c)–(1) (2012)); Sarnoff, *supra* note 64, at 110.

340. *See* Neeraj Arora, *Disabling Patentability for Skill-Based Inventions: Aligning Patent Law with Competition Policy*, 22 SANTA CLARA COMPUTER & HIGH TECH. L.J. 1, 38 (2005) (citing U.S. Patent No. 5,616,089 (filed Mar. 29, 1996); U.S. Patent No. 6,712,720 (filed Mar. 11, 2002));

America Invents Act amended section 101 to ban "a claim directed to or encompassing a human organism" to codify long-standing objections to patents on human beings.[341]

These morality and ethics based objections are more the exception to the rule than the rule, however, as the U.S. patent system has remained mostly agnostic about morality and ethics.[342] Unlike the European patent system, the U.S. patent system has no prohibitions against patenting inventions that contravene morality or public order.[343] Although the categories of exclusion may have originally had some basis in deontological concerns, morals change over time, as does technology.[344] Subject matter categories based on those morals would likely have changed over time as well. Over the decades, the courts have been presented with ethics based calls to ban patents on living organisms, genetic material, and other inventions, but then they have been reluctant to do so and have declined to add more categories of exclusions,[345] recognizing that morality and other social policies are best left for areas of law better suited to the task.[346]

Derek Bambaurer, *Legal Responses to the Challenges of Sports Patents*, 18 HARV. J. LAW & TECH. 401, 423–24 (2005); Kukkonen, *supra* note 148, at 823–24.

341. Leahy-Smith America Invents Act, Pub. L. No. 112-29, § 33(a), 125 Stat. 284, 340–41 (2011); *see also* Memorandum from Robert Bahr, Senior Patent Counsel, U.S. Pat. & Trademark Off., for Patent Examining Corps. (Sept. 20, 2011) (on file with U.S. Pat. and Trademark Off.) (discussing patent claims encompassing human beings); MPEP, *supra* note 182, § 2105, at 2123 (discussing patent claims encompassing human beings); Donald J. Quigg, *Animals – Patentability*, 1077 OFF. GAZ. PAT. OFF. 24 (Apr. 21, 1987), *available at* http://www.uspto.gov/web/patents/patog/week53/OG/TOCCN/item-137.htm#cli137 (discussing patent claims encompassing human beings and organic life forms).

342. *See generally* Bagley, *supra* note 215, at 474–75 (discussing the lack of morality-based limits on patentable subject matter).

343. Yvonne Cripps, *The Art and Science of Genetic Modification: Re-Engineering Patent Law and Constitutional Orthodoxies*, 11 IND. J. GLOBAL LEGAL STUD. 1, 20–21 (2004).

344. Robert P. Merges, *Intellectual Property in Higher Life Forms: The Patent System and Controversial Technologies*, 47 MD. L. REV. 1051, 1064–65 (1988) (citations omitted).

345. *See, e.g.*, Ass'n for Molecular Pathology v. Myriad Genetics, Inc., 133 S. Ct 2107, 2120 (2013) (declining to declare all genetic material unpatentable); Bilski v. Kapos, 130 S. Ct. 3218, 3229 (2010) (refusing to hold all business methods unpatentable); Diamond v. Chakrabarty, 447 U.S. 303, 310–17 (1980) (citations omitted) (declining to categorize all living organisms as unpatentable subject matter); AT&T Corp. v. Excel Comm. Mktg., Inc., 172 F.3d 1352, 1360 (Fed. Cir. 1999) (declining to declare all computer-based programming unpatentable); *see also* State Street Bank & Trust Co. v. Sig. Fin. Grp., Inc., 149 F.3d 1368, 1376 n.13 (Fed. Cir. 1998) (noting the difficulty of distinguishing business methods from "means of carrying it out"); Eisenberg, *supra* note 6, at 19–20 (citing Bilski v. Kappos, 130 S. Ct. 3218, 3229 (2010); Prometheus Labs. v. Mayo Collaborative Servs., 628 F.3d 1347 (Fed. Cir. 2010), *rev'd*, 132 S. Ct. 1289 (2012); Ass'n for Molecular Pathology v. U.S. Pat. & Trademark Off., 653 F.3d 1329, 1352 (Fed. Cir. 2011), *vacated*, 33 S. Ct. 2107 (2013)).

346. *See, e.g.*, *Chakrabarty*, 447 U.S. at 317–18 & n.11 (citing 41 Fed. Reg. 27,902 (July 7, 1976); 43 Fed. Reg. 60,080, 60,108, 60,134 (Dec. 22, 1978)); Juicy Whip, Inc. v. Orange Bang, Inc., 185 F.3d 1364, 1368 (Fed. Cir. 1999); Animal Legal Def. Fund v. Quigg, 932 F.2d 920, 923 (Fed. Cir. 1991).

IV. THE INEVITABILITY OF INTUITION IN DETERMINING PATENTABLE SUBJECT MATTER

The courts have cited a number of rationales for why certain claimed inventions are patentable subject matter and others are not. As the previous section demonstrates, none of these rationales actually explains why patentable subject matter law is the way it is. The courts clearly have definite ideas about what qualifies as patentable subject matter, however. So what does drive patentable subject matter law?

All patentable subject matter determinations are based on intuition—specifically, our intuitive understanding of what patentable technology and the useful arts are. Although alarming for its lack of predictability and lack of rigorous deductive reasoning,[347] the intuitive nature of patentable subject matter is unavoidable—and perhaps even desirable—in light of the fact that there is simply no other more rigorous and yet durable way of identifying the proper boundaries for patentable subject matter.

Before discussing the implications of intuitionism in patentable subject matter, however, it would be useful first to clarify what it means to say that patentable subject matter is based on intuition. Intuitionism in the law can manifest itself in a variety of forms for a variety of reasons.[348] The concept of intuitionism as used here refers specifically to the fact that patentable subject matter defies any sort of a clear and predictive definition through objective yardsticks, be they statutory categories, bright-line rules and tests, or even judicial precedent.[349] This is because the primarily economic rationales supposedly driving the patent system do not—and as explained in more detail below—cannot define what should or should not constitute patentable subject matter. This distinctive inability to rely on economic rationales thus often leaves us with patentable subject matter decisions that seem to be unarticulated and even unexplained. Indeed, it is exactly this inability to articulate or explain one's rationale that is the most generally understood meaning of intuitionism.[350]

The heavy reliance on intuitionism in patentable subject matter stems from two characteristics fundamental to the patent system. One, the patent must accommodate not only new developments, but also developments across an incredibly broad spectrum of technologies.[351] Patents are a one-size-fits-all system, and the vast and growing array of sciences and technologies that the patent system covers are all subject to the same patentability requirements and

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347. Wright, *supra* note 10, at 1382–83 (quoting Paul Gewirtz, *On "I Know It When I See It"*, 105 YALE L.J. 1023, 1024 (1996)); Mark C. Modak-Truran, *A Pragmatic Justification of the Judicial Hunch*, 35 U. RICH. L. REV. 55, 58 (2001).

348. *See generally* Wright, *supra* note 10, at 1385, 1398 (discussing the many forms intuitionism can take in legal decision-making).

349. Morris, *supra* note 41, at 505, 517.

350. *See* Wright, *supra* note 10, at 1389.

351. Morris, *supra* note 41, at 505.

protected under the same twenty-year term.[352] The patent system is also designed to incentivize the creation of novel and unique developments within these technologies.[353] The ever-changing array of subject matter that results, especially given the wide range of technologies swept under the patent banner, defies neat categorization or evaluation through bright-line rules or tests.[354] The patent system is consequently one of the most difficult areas of law in which to achieve clarity and predictability.[355]

The constant novelty of technological developments also limits the courts' ability to analogize from established precedent, which is itself an exercise in intuition.[356] When dealing with unique new technologies, how does one choose the most closely related and therefore relevant precedent? The less analogous the precedent or relevant the doctrine, the more a court is left to its own devices and its intuitions in making its decision.[357]

The second fundamental characteristic that forces reliance on intuition is the fact that patentable subject matter defies definition even by the less formalistic means of weighing and balancing rationales and policies.[358] When analogy to precedent, linguistic formulas, and statutory language do not dictate a particular outcome, courts often resort to underlying policies as first principles.[359] In the case of patentable subject matter, however, these primarily economic underlying policies are of no help. Legal decision-making based on a balance of factors such as these require some level of intuition,[360] but in the case of the patent system, the direction to which these factors point is simply indeterminate, making intuition all the more important.[361]

The purpose of the patent system is to promote progress in useful arts, but this does not and in fact cannot tell us what patentable subject matter boundaries should or should not be. The question of whether patenting any particular claimed invention might promote or might instead hinder technological progress is unfalsifiable. How to identify patentable subject matter in a way that best incentivizes technological progress without unduly hindering future innovation is

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352. *See* Duffy, *supra* note 5, at 614 (citing 35 U.S.C. § 154(a)(2) (2006)).

353. Morris, *supra* note 41, at 505.

354. *Id.*

355. *See* Duffy, *supra* note 5, at 616–17.

356. *See* Wright, *supra* note 10, at 1417–18 (quoting Case R. Sunstein, Commentary, *On Analogical Reasoning*, 106 HARV. L. REV., 741, 741–42 (1993); ALAN GOLDMAN, MORAL KNOWLEDGE 188 (1988)).

357. *See id.* at 1418.

358. Morris, *supra* note 41, at 505.

359. Larry Alexander, *The Banality of Legal Reasoning*, 73 NOTRE DAME L. REV. 517, 518–19 (1998); Modak-Truran, *supra* note 347, at 63, 65–66 (quoting Joseph C. Hutcheson, Jr., *The Judgment Intuitive: The Function of the "Hunch" in Judicial Decisions*, 14 CORNELL L. REV. 274, 276 (1928–29)).

360. Wright, *supra* note 8, at 1398.

361. Duffy, *supra* note 5, at 619–20.

perhaps impossible to determine without prescience.[362] Again, all patents have the potential to hinder further research and development, and how best to incentivize any given type of technological development is far from clear.[363] Unfortunately, what effect, if any, the patent system has at all is questionable.[364] How much any given subject matter might hinder or facilitate future research is therefore difficult, if not impossible, to predict.[365]

It therefore comes as no surprise that, despite the courts' constant references to preemption, disproportionality, certainty, and the other economic rationales underlying the patent system, the courts never actually apply these rationales in making patentable subject matter determinations. There is good reason to doubt whether the patent system could ever translate its economic rationales into effective patentable subject matter standards, however. Indeed, the indeterminacy of patent's underlying rationales is the primary reason that patentable subject matter is inevitably based on intuition.

Because of the patent system's unique features, every patent application effectively presents a case of first impression, leaving courts to figure out into which categories—included subject matter or excluded subject matter—each new invention.[366] These facts affect not only in how section 101 is drafted, but also in how it has been interpreted via rules and doctrines, precedent, and policy based derivative rationales, and how poorly those interpretations have fared.

It is not surprising, for example, that the categories of excluded and included subject matter are as vague as they are, for their vagueness provides the flexibility necessary to adjust future technological developments.[367] Nonetheless, the very ambiguity that allows such flexibility also begs some obvious questions. What do the four section 101 categories of included subject matter even mean? And on what basis were they established as included subject matter? Again, there is no reason to believe that patents on only processes, machines, manufactures, and compositions of matter promote progress in useful arts. Likewise, characterizations of abstract ideas, laws of nature, algorithms, or even phenomena of nature are so broad that they could cover a wide variety of

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362. Duffy, *supra* note 5, at 618 (quoting Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 584 U.S. 124, 128 (2006) (Breyer, J., dissenting)). Many others have written extensively about what patentable subject matter doctrine should be, and this Article does not try to retread that ground. *See, e.g.*, Chin, *supra* note 52 (criticizing "marketplace" definitions of patentable subject matter); Gruner, *supra* note 333 (discussing how patentable subject matter boundaries should be redrawn to accommodate intangible inventions); Lemley et al., *supra* note 88 (advocating an abstract idea test that focuses on claim breadth); Olson, *supra* note 10 (similar); Samuelson, *supra* note 213 (arguing against patents on computer program innovations manipulating information).

363. Eisenberg, *supra* note 6, at 49 (citing Diamond v. Chakrabarty, 447 U.S. 303, 315–16 (1980)); Sarnoff, *supra* note 64, at 56.

364. Chiang, *supra* note 58, at 1239 (citing Kaplow, *supra* note 347, at 1844); Duffy, *supra* note 5, at 619–20; Eisenberg, *supra* note 6, at 45; Olson, *supra* note 12, at 194.

365. *See* Merges & Nelson, *supra* note 69, at 848.

366. Duffy, *supra* note 5, at 639.

367. *Id.* at 611, 620.

subject matter, both patentable and unpatentable, as well as the wide variety of rationales for distinguishing between the two.[368]

The courts have sought not only to fill this void but also to give it a bright-line, predictive structure by implementing a multitude of judicial doctrines and tests.[369] The patent system seems to have articulated so many judicial doctrines and tests over the years that it seems to have a different rule or doctrine for every circumstance. Given the ever-changing landscape of technological development, however, these judicial doctrines and tests have not fared well.[370] All these judicial doctrines and tests are inevitably modified and then outright rejected over time as new inventions arise and challenge old doctrinal paradigms.[371] As the Supreme Court explained in *Bilski*, bright-line rules such as the machine or transformation test do not adapt well to the constantly evolving technologies covered by the patent system, and "new technologies may call for new inquiries."[372] New technologies present new challenges to the definition of patentable subject matter, and bright-line rules do not adapt well to such challenges.[373]

The Court's opinion in *Bilski* is also a perfect example of the ambiguity inherent in the definition of an abstract idea, and the rationales for excluding abstract ideas. *Bilski* involved a so-called business method patent, under which the petitioners sought protection of a method for hedging risk against price changes in the energy commodities market.[374] The Court affirmed the Federal Circuit's decision that the method was an unpatentable abstract idea, but neither the Supreme Court nor the Federal Circuit below seemed to be able to agree amongst themselves as to why the method was an abstract idea.

For example, at one point the *Bilski* majority opinion seemed to indicate that the method was unduly broad because hedging risk is at base nothing more than a mathematical formula or fundamental principle, and is therefore unpatentable

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368. *See* Collins, Bilski, *supra* note 6, at 44 (noting the vague and broad definitions of an abstract idea); Eisenberg, *supra* note 6, at 46.

369. Tun-Jen Chiang, *The Rules and Standards of Patentable Subject Matter*, 2010 WIS. L. REV. 1353, 1356 (citing *In re Bilski*, 545 F.3d at 952); Duffy, *supra* note 5, at 647; Eisenberg, *supra* note 6, at 4, 16 (citing Classen Immunotherapies, Inc. v. Biogen IDEC, 304 F. App'x 866 (Fed. Cir. 2008), *cert. granted, vacated*, Classen Immunotherapies, Inc. v. Biogen IDEC, 130 S. Ct. 3541 (2010)).

370. *See, e.g.*, *In re* Warmerdam, 33 F.3d 1354, 1358–59 (Fed. Cir. 1994) ("[T]his court and its predecessor, as well as the Patent and Trademark Office (PTO), have sought to find more precise definitions for the things excluded, but without complete success."); *see also* Duffy, *supra* note 5, at 616–17 (noting difficulty of adapting patentable subject matter restrictions to technological changes).

371. *See, e.g.*, *supra* text accompanying notes 108–29.

372. Bilski v. Kappos, 130 S. Ct. 3218, 3228 (2010); *accord* Gottschalk v. Benson, 409 U.S. 63, 71 (1972); CLS Bank Int'l v. Alice Corp. Pty., 717 F.3d 1269, 1281 (Fed. Cir. 2013) (quoting *Benson*, 409 U.S. at 71); Duffy, *supra* note 5, at 616–17.

373. Chiang, *supra* note 369; Duffy, *supra* note 5, at 610–11; Morris, *supra* note 41, at 498.

374. *Bilski*, 130 S. Ct. at 3223–24.

subject matter like laws or phenomena of nature.[375] At other points in the *Bilski* opinion, however, the majority warned against categorical limitations on patentable subject matter, noting that it is novelty, non-obviousness, and the other patentability requirements that serve to protect against unduly broad patent scope.[376] In fact, in more or less the same breath, the *Bilski* majority seemed to suggest that the petitioners' risk hedging method was unpatentable not so much because it did not fit within the confines of patentable subject matter under section 101, but because the method was unpatentable as anticipated or obviousness.[377] The Court further hinted that many business methods fall into the abstract idea category because they are so vague that they lack definiteness or enablement.[378]

Which of these rationales was determinative in the *Bilski* case, and which were dicta is not at all clear, nor is the guidance that we should take from the Court's opinion. As Justice Stevens noted in his concurrence in *Bilski*, the Court has "never provide[d] a satisfying account of what constitutes an unpatentable abstract idea."[379] Again, anyone reading *Bilski* is left with the impression that the decision is based on nothing more than intuition—and it is. Business methods such as the one in *Bilski* just do not seem to fit within general perceptions of patentable technology or technological work. Business methods may involve technology, but the methods themselves seem more like a question of economics or social constructs better classified as liberal arts, not technological arts.[380]

This same intuitive sense of patentable technology also excludes raw data, mathematical algorithms, expressive and artistic works, and other descriptive material as unpatentable subject matter primarily because they simply do not fit intuitive conceptions of useful arts.[381] Similarly, why discoveries are unpatentable subject matter is unclear aside from the fact that patenting the products of human ingenuity rather than natural forces has intuitive appeal.[382] Machines, on the other hand, are exactly what one might intuitively think of

375. *Id.* at 3231.

376. *Id.* at 3229.

377. *Id.* at 3229–30.

378. *Id.* at 3229.

379. *Id.* at 3236 (Stevens J., concurring).

380. *See* John F. Duffy, *Why Business Method Patents?*, 63 STAN. L. REV. 1247 (2011); John R. Thomas, *The Patenting of the Liberal Professions*, 40 B.C. L. REV. 1139, 1169 (1999); *see also* Wade M. Chumney et al., *Patents Gone Wild: An Ethical Examination and Legal Analysis of Tax-Related and Tax Strategy Patents*, 46 AM. BUS. L.J. 343, 403 (2009) (noting the intuitive nature of objections to tax-strategy patents).

381. *See* Collins, *supra* note 87, at 18; Samuelson, *supra* note 296, at 1112 (quoting CHISUM, *supra* note 40, § 1.01, at 1–7).

382. *See* Eisenberg, *supra* note 210, at 786; *see also* Morris, *supra* note 41 (noting patentable subject matter is defined by "artifice and action").

when thinking of "technology,"[383] although even then, not all uses of machines fit intuitions about patentable technology.[384]

That being said, this Article is not meant to suggest that patentable subject matter determinations are merely wild guesses, completely without a frame of reference. While intuitionism suggests lack of objectivity and even randomness,[385] even the most intuitive decision-making has some guiding principles.[386] Despite the Federal Circuit's rejection of technological arts as a bright-line linguistic test,[387] the courts have interpreted Article I, Section 8's mandate as limiting section 101.[388] The courts must therefore adhere to the guiding principle in patentable subject matter that covers only that which promotes progress in useful arts—such as that which constitutes patentable technology within the meaning of Article I, Section 8. This guiding principle is only that, however. With little else to guide them, the courts must depend heavily on intuition in discerning what is or is not patentable technology.

But as argued elsewhere, an intuitive understanding of patentable technology, although untethered to economic rationales, has nonetheless proven to be surprisingly consistent over time. Within the courts' repeated attempts to define technology are two concepts that characterize all patentable subject matter—the concepts of artifice and action. All patentable subject matter displays some threshold degree of artifice, roughly defined as perceived degree of alteration through human intervention.[389] Likewise, all patentable subject matter must also display at least a threshold degree of action, roughly defined as new operation or activity through human intervention.[390] Together, artifice plus action explain and, perhaps more importantly, unify the law on patentable subject matter.[391]

Of course, any intuition based definition of patentable technology will never be anything like a conveniently predictable bright-line rule nor is it necessarily optimal for promoting progress in useful arts. Nevertheless, patentable subject

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383. *See* CHISUM, *supra* note 40, § 1.02[1], at 1–12 (quoting 1 A. DELLER, WALKER ON PATENTS 119 (2d ed., 1964)).

384. *See supra* text accompanying notes 254–57.

385. *See* Wright, *supra* note 10, at 1382 (quoting Gewirtz, *supra* note 370, at 1024); Modak-Truran, *supra* note 347, at 58.

386. *See* Wright, *supra* note 10, at 1394.

387. *In re* Bilski, 545 F.3d 943, 960 (Fed. Cir. 2008) (en banc); *see also* Diamond v. Diehr, 450 U.S. 175, 200–01 (1981) (citations omitted) (mentioning debate over "technological arts" test).

388. *See, e.g.*, In re *Comiskey*, 554 F.3d 967, 976–77 (Fed. Cir. 2009) ("The Constitution explicitly limited patentability to 'the national purpose of advancing the useful arts—the process today called technological innovation.") (quoting Paulik v. Rizkalla, 760 F.2d 1270, 1276 (Fed. Cir. 1985) (en banc)); *see also* Durham, *supra* note 20, at 1428–29 (quoting *In re* Musgrave, 431 F.2d 882, 893 (C.C.P.A. 1970)) (citing CHISUM, *supra* note 40, § 1.01, at 1–6).

389. Morris, *supra* note 41, at 29–31 (quoting Diamond v. Chakrabarty, 447 U.S. 303, 309 (1980)) (citing Hartranft v. Wiegmann, 121 U.S. 609, 615 (1887)).

390. Morris, *supra* note 41, at 31–34.

391. *See* Morris, *supra* note 41, at 64–82.

matter can at least be defined by those general features that do consistently distinguish patentable from unpatentable technology.

Further, as explained above, patentable subject matter law has some purpose and does some work beyond that of the other patentability requirements. To be sure, patentable subject matter overlaps with and serves some of the same purposes as the other patentability requirements, such as distinguishing vague ideas from concrete inventive concepts.[392] But only patentable subject matter serves to distinguish patentable technology from unpatentable discoveries, information, and human thought and activity. Patentable subject matter restrictions cabin the patent system to patentable technology and the useful arts, as vague and intuitive as those concepts may be.[393] Only once patentable subject matter has been established do the other patentability requirements winnow out those technologies that are not novel, non-obvious, and complete enough to warrant patent protection.

Whether restricting the patent system to only those inventions that are intuitively perceived as technological serves in any way to promote technological progress is an open question, of course. Perhaps, if nothing else, these restrictions achieve some minimal level of uniformity within the one-size-fits-all patent system by limiting it to only inventions that meet intuitive understandings about protectable technology.[394] Regardless, patentable subject matter does impose restrictions that no other patentability requirement does.

The patent system nonetheless must rely on intuition to distinguish the technological from the non-technological arts. While this kind of resort to intuitionism may seem suspect when there is no right answer to an unfalsifiable question, intuition is no worse than any other answer.[395] Where cases present novel or complex questions, resolution of those questions will inevitably fall back on "judgment and practical wisdom," that is, intuition.[396]

Indeed, many commentators and jurists have long commented on patent law's reliance on intuitionism.[397] In modern times the issue is usually phrased more as one about standards versus rules, but the underlying point is the same: in order to achieve the flexibility to address new technologies and technological

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392. *See supra* text accompanying notes 150–83 (discussing relationship between patentable subject matter restrictions and novelty, non-obviousness, and other patentability requirements).

393. *See* text accompanying notes 168–172.

394. *See* Eisenberg, *supra* note 6, at 48 (citing Michael W. Carroll, *One Size Does Not Fit All: A Framework for Tailoring Intellectual Property Rights*, 70 OHIO ST. L.J. 1361 (2009); Michael W. Carroll, *One For All: The Problem of Uniformity Cost in Intellectual Property Law*, 55 AM. U. L. REV. 845, 849 (2006)).

395. Wright, *supra* note 10, at 1394–95.

396. Wright, *supra* note 10, at 1421; *see also* Joseph C. Hutcheson, Jr., *The Judgment Intuitive: The Function of the "Hunch" in Judicial Decisions*, 14 CORNELL L. REV. 274, 278 (1928–29) (discussing use of intuition in complex issues).

397. 1 GEORGE LITCH ROBERTS, PATENTABILITY OF INVENTIONS AND THE INTERPRETATION OF PATENTS 181 (Little, Brown, and Co. ed., 1927) (quoting Krementz v. S. Cottle Co., 148 U.S. 556 (1892)); Hutcheson, *supra* note 359, at 283 (quoting ROBERTS, *supra*, at 181).

developments as they arise, patent law must be flexible in a way that bright-line rules cannot. Unlike rules, which specify ahead of time how the law should be applied, standards provide only the rough contours of the law, leaving for later a determination of how exactly to apply that law to the circumstances at hand.[398] Standards therefore provide less predictability up front but greater flexibility to address uncertain conditions and, as a result, are better able to withstand the tests of time.[399] Because standards are more open-ended, however, they are also much more subject to discretion and the exercise of judgment than are bright-line rules.[400] Intuitionism and the use of standards over rules are thus congruent in many ways.[401]

Not surprisingly, standards—and hence, intuitionism—are common in patent law. The non-obviousness, utility, enablement, and even written description requirements all lie along a spectrum, forcing courts to make judgment calls about how non-obvious, useful, or enabled an invention must be to be patentable.[402] Non-obviousness, for example, is an area of patent law in which the Supreme Court has rejected rigid, bright-line rules, favoring instead "an expansive and flexible approach" based on prior art and the PHOSITA standard, but providing little other guidance in defining the threshold between obviousness and non-obviousness.[403] Non-obviousness doctrine has been widely criticized for lacking a solid definitional foundation,[404] but commentators have also widely acknowledged the need for flexibility across highly divergent technologies.[405] Much the same story applies with regard to the enablement requirement. The courts have rejected rigid adherence to bright-line rules in favor of a more discretionary enablement standard that allows the flexibility to address the technology at hand.[406] Given the constantly changing nature of patentable technology, the Supreme Court has often voiced a preference for standards over

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398. Louis Kaplow, *Rules Versus Standards: An Economic Analysis*, 42 DUKE L.J. 557, 557 (1992).

399. Chiang, *supra* note 369, at 1355; Duffy, *supra* note 5, at 610–11; Morris, *supra* note 41, at 517–19; *see also* Carol M. Rose, *Crystals and Mud in Property Law*, 40 STAN. L. REV. 577, 609 (1988) (arguing that broad "muddy" rules are often more effective than clear, "crystal" rules).

400. *See* Eisenberg, *supra* note 6, at 14; Wright, *supra* note 10, 1398–99.

401. Roscoe Pound, *The Theory of Judicial Decision*, 36 HARV. L. REV. 940, 951 (1923).

402. *See* Burk & Lemley, *supra* note 99, at 1577; Duffy, *supra* note 5, at 639 (citing KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 419 (2007); Brenner v. Manson, 383 U.S. 519, 534–35 (1966); *In re* Fisher, 421 F.3d 1365, 1371 (Fed. Cir. 2005)).

403. *KSR Int'l Co.*, 550 U.S. at 415; Gregory Mandel, *The Non-Obvious Problem: How the Indeterminate Nonobviousness Standard Produces Excessive Patent Grants*, 42 U.C. DAVIS L. REV. 57, 70 (2008).

404. *See* Michael Abramowicz & John F. Duffy, *The Inducement Standard of Patentability*, 120 YALE L.J. 1590, 1609 (2011); Jeanne C. Fromer, *The Layers of Obviousness in Patent Law*, 22 HARV. J.L. & TECH. 75, 76 (2008); Mandel, *supra* note 403, at 64.

405. *See* Abramowicz & Duffy, *supra* note 404, at 1645; Burk & Lemley, *supra* note 99, at 1579; Mandel, *supra* note 365, at 126 (citing Rose, *supra* note 403, at 604–10).

406. *See* Burk & Lemley, *supra* note 99, at 1670; Kevin Emerson Collins, *Enabling After-Arising Technology*, 34 J. CORP. L. 1083, at Pt. II (2009).

bright-line rules across a range of patent issues, including patentable subject matter.[407]

In point of fact, saying that what qualifies as patentable technology and promotes useful arts is inevitably intuitive in nature is the same as saying that patentable subject matter is defined by the standard of what qualifies as a useful, or technological, art. It is an exceedingly brief standard, to be sure, and provides little to no direction in how it is to be applied. The courts, which could not possibly have the technological expertise to understand fully every invention that comes before them, may prefer bright-line rules to guide their decisions and relieve them of the need to engage deeply in the technology at hand.[408] As much as the law may strive for structure and predictability, however, patentable subject matter doctrine must chart such uncertain waters that the correct outcome and any objectively explicit rationale for reaching to that outcome are far from clear. Although bright-line rules can provide greater predictability, rigid adherence to a bright-line rule can produce results that would strike anyone as just intuitively absurd.

Moreover, intuitionism, standards, and case by case balancing of factors are common in many areas of intellectual property law. Professor Mark McKenna, for example, has written convincingly on the lack of a cohesive rationale when it comes to distinguishing protectable from unprotectable subject matter under trademark law's functionality doctrine.[409] The courts have long wavered on the policy rationales underlying the functionality doctrine, and stated methods for identifying and even defining functionality vary case by case. Instead, what really seems to be driving application of the functionality doctrine is "longstanding, if unexamined, intuitions about the types of features that are competitively important."[410]

Others have also noted a similar reliance on intuition when it comes to copyrightable subject matterand distinguishing protectable expression from unprotectable ideas. [411] As Professor Lloyd Weinreb has noted, all expression

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407. Duffy, *supra* note 5; Eisenberg, *supra* note 6, at 14 n.77. *But see* David O. Taylor, *Formalism and Antiformalism in Patent Law Adjudication: Rules and Standards*, 46 CONN. L. REV. 415, 422–23 (2013) (arguing that patent law should employ more bright-line rules).

408. *See generally* Peter Lee, *Patent Law and the Two Cultures*, 120 YALE L.J. 2, 10–11 (2010) (quoting Stephen Breyer, *Introduction* to FED. JUDICIAL CTR., REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 1, 3 (2d ed. 2000)) (arguing that formalism can relieve judges of the need to engage in highly complex technological concepts); *cf.* Ethyl Corp. v. Envtl. Prot. Agency, 541 F.2d 1, 67 (D.C. Cir. 1976) (en banc) (Bazelon, C.J., concurring) (citing Etvtl. Def. Fund, Inc. v. Ruckelshaus, 439 F.2d 584, 597–98 (1971)) ("[S]ubstantive review of mathematical and scientific evidence by technically illiterate judges is dangerously unreliable.").

409. McKenna, *supra* note 286, at 824.

410. *Id.* at 824–25

411. *See, e.g.*, Nichols v. Universal Pictures Corp., 45 F.2d 119, 123 (2d Cir. 1930) ("'[W]hile we are as aware as anyone that the line [between protectable and unprotectable content], wherever it is drawn, will seem arbitrary, that is no excuse for not drawing it; it is a question such as courts must answer in nearly all cases'"); Lee, *supra* note 408, at 14 (quoting Leslie A. Kurtz, *Speaking to the Ghost: Idea and Expression in Copyright*, 47 U. MIAMI L. REV. 1221, 1222 (1993)).

derives from and includes ideas, and as such, distinguishing between the two is fraught with difficulty.[412] Professor Weinreb demonstrates that how courts decide whether something is an unprotectable idea or copyrightable expression are typically just ad hoc rationalizations tailored to the court's desired outcome, and that the policies supposedly underlying copyright protection more generally—including many of those, such as incentives and natural rights, that have been cited in support of patent doctrine fail to explain how courts actually identify copyrightable subject matter.[413] As Professor Weinreb explains it, "the arguments turn out to be based on theoretical assumptions having little more concrete underpinning than a conventional understanding that books and certain other kinds of authorial works are copyrightable, the very proposition that the policies are said to justify."[414] In other words, courts do not rely on doctrine, but instead simply rely on intuition to tell them what is copyrightable subject matter.

The next logical question, of course, is how intuitions are developed about the proper subject matter for the various types of intellectual property protections. How is it that courts develop an intuitive sense of what falls within the confines of patentable subject matter? In addressing the same question regarding copyrightable subject matter, Professor Weinreb refers to a conventional understanding of what may be copyrighted based on historical practice and understandings that have persisted despite the myriad technological developments that have created new media for expression.[415] The same can likely be said of intuitive or conventional understandings of what constitutes patentable subject matter. Courts and commentators alike routinely refer to historical understandings of the patent system in analyzing patentable subject matter,[416] and they are undoubtedly correct in recognizing history's influence. Applying these historically based understandings to modern day technologies presents obvious difficulties but hence the reliance on intuitionism.

As the discussion above demonstrates, intuition plays a much larger role in patentable subject matter than just a few isolated cases. The role of intuitionism in patent law is inevitable, however, and acknowledgment as such is not necessarily a condemnation of either the patent system generally or patentable subject matter law specifically. Indeed, acknowledging the intuitive, indeterminate nature of decision-making in patentable subject matter can actually

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412. Weinreb, *supra* note 296, at 1153.

413. *Id.*

414. *Id.*

415. *Id.* at 1180–93; *see also* Lee, *supra* note 408, at 14 ("A brief foray into copyright law further illustrates the difficulties posed by technological subject matter.")

416. *See* Bilski v. Kappos, 130 S. Ct. 3218, 3232 (2010) (Stevens, J., dissenting); Diamond v. Diehr, 450 U.S. 175, 182–84 (1981) (citations omitted); *In re* Bilski, 545 F.3d 943, 966–72 (Fed. Cir. 2008) (Dyk, J., concurring) (citations omitted); *see generally* Coulter, *supra* note 8, at 487 (exploring the history of the term "useful Arts" in Article I, Section 8, Clause 8 of the Constitution); Durham, *supra* note 20 (comparing historical understandings of "useful Arts" with information technologies); Gruner, *supra* note 333, at 376 (quoting Coulter, *supra* note 8, at 498) (similar); Sarnoff, *supra* note 64 (explaining the origin of categorical exclusions).

foster the legitimacy of that decision-making.[417] And in any event, adverting to the large role intuition inevitably plays can perhaps at least save the patent system from expending further resources on trying to devise yet more bright-line rules to address patentable subject matter.

V. CONCLUSION

Patentable subject matter is a difficult area of law. The existing broad categories of included and excluded subject matter are vague, and the rules and rationales proffered thus far for distinguishing between the two have resulted only in further confusion.

This is not surprising. Patent law is a one-size-fits-all system, but is designed not only to incentivize the creation of new and unique inventions but also to do so across a wide array of technologies. Creating uniform patentable subject matter criteria to address such a wide diversity of technology is difficult enough.[418] Creating criteria that would optimize the balance between incentivizing investments in technology with unduly hindering future development is impossible. This leaves the courts with nothing on which to rely except their own intuitions in determining what is or is not technology and therefore a useful art within the meaning of the Constitution's intellectual property clause.[419]

Indeed, far from being the cause of patentable subject matter's indeterminacy, resort to intuition is simply that indeterminacy's inevitable result. Rather than cycling through and ultimately abandoning judicial test after economic rationale after legal precedent in hopeless pursuit of precision then, perhaps a better approach is simply to embrace patentable subject matter's unavoidably intuitive nature. Explicitly acknowledging the intuitive nature of patentable subject matter allows us to recognize that patentability is not a bright-line, binary characteristic, but rather a matter of judgment best governed by standards rather than bright-line rules. This in turn will allow the patent system to adapt to new technologies more readily by moving away from the kinds of efforts at bright-line rules that have led patentable subject matter doctrine astray.

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417. *Cf.* Jessie Allen, *The Persistence of Proximate Cause: How Legal Doctrine Thrives on Skepticism*, 90 DENV. U. L. Rev. 77 (2012) (discussing how acknowledging indeterminacy and intuitive decision-making can enhance credibility).

418. *See* Duffy, *supra* note 5, at 614 (arguing that "rules" restricting patentable subject matter prove unstable due to technological change); Gruner, *supra* note 221, at 356 n.5 (similar).

419. *See* U.S. CONST. art. I, § 8, cl. 8.