

2015

The Three Faces of Prometheus: A Post-Alice Jurisprudence of Abstractions

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Jeffrey A. Lefstin, *The Three Faces of Prometheus: A Post-Alice Jurisprudence of Abstractions*, 16 *N.C. J.L. & Tech.* 647 (2015).
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**THE THREE FACES OF PROMETHEUS:
A POST-ALICE JURISPRUDENCE OF ABSTRACTIONS**

*Jeffrey A. Lefstin**

While Alice v. CLS Bank has confirmed that patent claims require a further “inventive concept” beyond an underlying abstract idea or law of nature for patent-eligibility, there is little agreement on what defines either an “abstract idea” or an “inventive concept.” Resolving this uncertainty is critical to determining the patent-eligibility of software claims beyond the simple “do it on a computer” type invalidated in Alice. This Article argues that the rationale and two-step analysis articulated in Mayo and Alice represents a fundamental reorientation of the Supreme Court’s jurisprudence, effectively superseding the Court’s earlier § 101 cases. Based on the structure of the Mayo/Alice test, this Article argues for a differentiated framework of “inventive concept,” requiring inventive application for most abstract ideas, but only non-generic application for most laws of nature. Under this framework, two key classes of subject matter remain patent-eligible: (1) claims that do more than reveal the results of an underlying law of nature, and (2) claims to specific and inventive information-processing techniques.

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I. INTRODUCTION

The doctrine of patent-eligible subject matter delineates the domain of the patent system: what constitutes an “invention or discovery”¹ that may be the subject of a patent. Qualification as patent-eligible subject matter is the beginning, not the end of the question of patentability; even if an invention is patent-eligible, it must meet the statutory requirements of utility, novelty, non-obviousness, adequate disclosure, and definite claiming before it can be awarded a patent.

After leaving the doctrine in the hands of the lower courts for nearly thirty years, the Supreme Court has issued four decisions on the doctrine in the span of five years.² Yet there is now less clarity on the basic question of patent-eligibility than at almost any other time in American patent law. After the Court’s latest decision, *Alice Corp. v. CLS Bank*,³ it is clear that a basic principle of business or economics, coupled with a direction to “do it on a computer” or “do it on the Internet,” is not patent-eligible subject matter. Scores, if not hundreds, of such patents have met their doom in the courts or at the United States Patent and Trademark Office (“USPTO”) in the wake of *Alice*. Yet given the Court’s reluctance to provide specific guidance, there is little agreement on how the analysis of patent-eligibility should be structured. Moreover, while generic implementations of modes of organizing human activity are clearly ineligible under *Alice*, the case did little to clarify the general question of software patentability. A critical question left unresolved by *Alice* is whether a specific implementation of an information processing algorithm—for example, a method of embedding error-correction information in a digital transmission—constitutes patent-eligible subject matter. And software is not the only field where the Court’s decisions have left the scope of patent-eligible subject matter unsettled. Based on a broad interpretation of the Court’s earlier decision in *Mayo v.*

¹ 35 U.S.C. § 100 (2014).

² *Alice Corp. Pty. v. CLS Bank Int'l*, 134 S. Ct. 2347 (2014); *Ass'n for Molecular Pathology v. Myriad Genetics, Inc.*, 133 S. Ct. 2107 (2013); *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289 (2012); *Bilski v. Kappos*, 561 U.S. 593 (2010).

³ 134 S. Ct. 2347 (2014).

Prometheus,⁴ the courts and the USPTO are now invalidating a wide variety of claims in the biotechnological arts on the grounds that they are directed to ineligible laws of nature.⁵ But the exact boundary between unpatentable laws of nature and patentable applications remains ill-defined.

The major obstacle to consistency and predictability in the field is the incoherence of the Supreme Court's opinions. Over the last forty years, the Supreme Court's subject-matter jurisprudence has shifted radically in both rationale and analysis not only from the doctrine's historical moorings,⁶ but also within the Court's modern cases themselves. Moreover, while in other fields the Court readily acknowledges the disorder of its jurisprudence,⁷ over the last four decades, the Court has pretended that its subject-matter jurisprudence is a coherent whole. The result is that lower tribunals can select from a patchwork collection of incongruous analyses and rationales in order to yield a desired outcome.

But the point of this Article will not be to criticize the Court's jurisprudence, nor to attempt a reconciliation of that jurisprudence into a coherent whole, nor to propose a grand unified theory of patent-eligible subject matter. Rather, this Article takes the Court's decisions in *Mayo* and *Alice* as a given. Its central thesis is that the test of patent eligibility pronounced in *Mayo* and *Alice* represents an opportunity to discard much of the doctrinal detritus that has accumulated around the law of patent-eligible subject matter over the last forty years. By focusing on the structure of the *Mayo/Alice*

⁴ 132 S. Ct. 1289 (2012).

⁵ See Bernard Chao & Lane Womack, *USPTO Is Rejecting Potentially Life-Saving Inventions*, IP LAW 360 (Dec. 18, 2014), <http://www.law360.com/articles/604808/uspto-is-rejecting-potentially-life-saving-inventions>.

⁶ See Peter S. Menell, *Forty Years of Wondering in the Wilderness and No Closer to the Promised Land: Bilski's Superficial Textualism and the Missed Opportunity to Return Patent Law to Its Technology Mooring*, 63 STAN. L. REV. 1289, 1290–91 (2011) (“The past forty years of patentable subject matter jurisprudence harkens back to the Israelites' wandering through the wilderness following the exodus from Egypt.”).

⁷ See *Gunn v. Minton*, 133 S. Ct. 1059, 1065 (2013) (“In outlining the contours of this slim category [cases of federal ‘arising under’ jurisdiction over state-law claims], we do not paint on a blank canvas. Unfortunately, the canvas looks like one that Jackson Pollock got to first.”).

test, as well as the rationale for subject matter exclusions articulated in *Mayo* and *Alice*, this Article derives meanings for the key notions of “inventive concept” and “abstract idea” that the Court has left undefined. Under these meanings, two significant categories of inventions are shown to be patent-eligible subject matter under *Mayo* and *Alice*: specific applications of newly discovered laws of nature and specific, human-created information-processing methods that are implemented on computers.

Part II of this Article briefly reviews the history of the patent-eligible subject matter doctrine, leading up to the Court’s key decisions in *Mayo* and *Alice*. Part III argues that the analytical framework employed by the Court in *Mayo* and *Alice* represents a significant break in the Court’s patent-eligibility jurisprudence, and that a jurisprudence of patent-eligibility should be built based upon the structure of that framework. Part IV then examines the “inventive concept” required by *Mayo* for patent-eligibility, exploring the three different notions of inventive concept suggested in the *Mayo* opinion. Part V argues, based on the theory that the patent system functions to incentivize technological development under conditions of uncertainty, that different standards of inventive concept should be required for inventions based on discovery and those inventions not based on discovery. Part VI then concludes that, under this framework, specific and inventive information-processing algorithms represent means of application rather than abstract ideas, and should therefore be patent-eligible under the *Mayo/Alice* test.

II. THE TANGLED WEB OF THE SUPREME COURT’S JURISPRUDENCE

Generally speaking, American patent law from the mid-nineteenth to the mid-twentieth century drew the boundary of patent-eligibility at *practical application*.⁸ Fundamental principles, such as laws of nature, were not patent-eligible *in the abstract*, but a practical application of a principle was patent-eligible provided

⁸ See Jeffrey A. Lefstin, *Inventive Application: A History*, 67 FLA. L. REV. (forthcoming 2015) (manuscript at 44–45, 58–59) (on file with author).

the inventor had sufficiently disclosed a means of application.⁹ While this distinction represented the main boundary of the patent system, it was subject to two significant exceptions. First, courts usually limited the field of the patent system to the industrial or technological arts.¹⁰ Second, courts generally required some tangible means of application for a principle to be patent-eligible.¹¹ Furthermore, whether derived from those two limitations or supplementing them, courts excluded inventions from patent-eligibility if they fell into the categories of “printed matter” and “mental steps.”¹²

The Supreme Court strayed from the traditional approach in its first software cases, *Gottschalk v. Benson*¹³ and *Parker v. Flook*,¹⁴ where it held that claims to particular practical applications of mathematical algorithms were not patent-eligible. But in *Diamond v. Diehr*,¹⁵ where the Court considered a claim to an automated process of molding rubber, the Court seemed to revert to the traditional standard of patent eligibility. Although the claimed process used a well-known algorithm to calculate when the rubber was fully cured, the *Diehr* Court found that process to be patent-eligible, explaining that “when a claim recites a mathematical formula (or scientific principle or phenomenon of nature), an inquiry must be made into whether the claim is seeking patent protection for that formula *in the abstract*.”¹⁶

Yet in its modern decisions, the Supreme Court appears to have turned its back on the traditional framework for patent eligibility. Nearly thirty years after *Diehr*, the Supreme Court decided *Bilski v. Kappos*,¹⁷ in which the claimed invention was a method of hedging risk in commodity markets. In *Bilski*, the Court explained that only one principle governed patent-eligibility under § 101:

⁹ See *id.* (manuscript at 30).

¹⁰ See Menell, *supra* note 6, at 1294–96.

¹¹ See Lefstin, *supra* note 8 (manuscript at 59).

¹² See *id.* (manuscript at 48).

¹³ 409 U.S. 63 (1972).

¹⁴ 437 U.S. 584 (1978).

¹⁵ 450 U.S. 175 (1981).

¹⁶ *Id.* at 191 (emphasis added).

¹⁷ 561 U.S. 593 (2010).

abstract ideas, laws of nature, and natural phenomena are not patent-eligible. While the Court declined to define those categories, everything the Court had said in its prior § 101 opinions, according to *Bilski*, had merely been elaborations on those basic exclusions.¹⁸ And while Justice Stevens, joined by three other members of the Court, would have excluded business methods from patent-eligibility, the majority refused to exclude business methods or other non-technological inventions from patent-eligibility. *Bilski* therefore effectively repudiated the historical limitation of the patent system to technological or industrial arts.¹⁹ *Bilski* also deprecated the historical focus on tangibility by rejecting the Federal Circuit's "machine-or-transformation" standard as the exclusive test of patent-eligibility of a process under § 101.²⁰ While *Bilski* allowed that the machine-or-transformation standard (which had been raised in *Benson*) provided "a useful clue" to patent-eligibility, the Court's subsequent opinions rejected arguments based on tangibility or physical transformation.²¹

In *Bilski*, the Court said little about how to distinguish between fundamental principles and patent-eligible inventions; the Court's analysis simply declared the claims at issue to be abstract ideas.²² However, in *Mayo v. Prometheus*, where the disputed claims recited a method of determining optimal drug dosage by measuring the concentration of a drug metabolite, the Court articulated a new

¹⁸ See *id.* at 603 ("Any suggestion in this Court's case law that the Patent Act's terms deviate from their ordinary meaning has only been an explanation for the exceptions for laws of nature, physical phenomena, and abstract ideas.").

¹⁹ See *id.* at 606–09 (rejecting exclusion for business methods).

²⁰ See *id.* at 602–06 (rejecting machine-or-transformation test as exclusive standard for patent-eligibility of a process).

²¹ See *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1302–03 (2012) (holding that machine-or-transformation test does not trump law of nature exclusion); *Alice Corp. Pty. v. CLS Bank Int'l*, 134 S. Ct. 2347, 2358–60 (2014) (stating that the fact that a computer is tangible is "beside the point," and rejecting the distinction between claims to an intangible method and claims to a computer or data storage medium).

²² See *Bilski*, 561 U.S. at 611 ("The concept of hedging, described in claim 1 and reduced to a mathematical formula in claim 4, is an unpatentable abstract idea, just like the algorithms at issue in *Benson* and *Flook*.").

analytical framework for patent eligibility. Framing the patent-eligibility inquiry as a distinction between unpatentable laws of nature and patent-eligible applications of those laws,²³ the Court explained that to be patent-eligible, a claim must recite a further “inventive concept” beyond the underlying law of nature or abstract idea.²⁴ In its analysis of the invention in *Mayo*, the Court regarded the relationship between metabolite levels in the blood and therapeutic efficacy that had been discovered by the inventor as a law of nature.²⁵ The claims in the case merely recited the known steps of administering the drug and determining the level of the metabolite, wherein specified levels of the metabolite indicated a need to increase or decrease dosage of the drug.²⁶ While they may have represented a practical application of the law of nature, the claims did not “add enough” to that law of nature to constitute a patent-eligible application.²⁷

The Court’s next patent-eligibility case, *Association of Molecular Pathology vs. Myriad Genetics*,²⁸ made no reference to *Mayo*’s “inventive concept.” The Court’s holding, that isolated and purified human genetic sequences were not patent-eligible, seemed premised only on § 101’s requirement that an invention be “new.”²⁹ However, in *Alice Corp. v. CLS Bank*,³⁰ the Court confirmed that *Mayo*’s framework is the general test for patent eligibility. *Mayo*, as explicated in *Alice*, involves a two-step inquiry. First, determine whether a claim was directed to an unpatentable abstract idea or law of nature.³¹ And second, determine whether the claim contains an inventive concept that transforms the claim into a patent-eligible application.³² For the claims at issue in *Alice*, which were directed to a method of mitigating settlement risk in financial transactions, limitations that

²³ See *Mayo*, 132 S. Ct. at 1294.

²⁴ See *id.*

²⁵ See *id.* at 1296–97.

²⁶ See *id.* at 1297.

²⁷ See *id.* at 1298.

²⁸ 133 S. Ct. 2107 (2013).

²⁹ See *id.* at 2116 (quoting 35 U.S.C. § 101).

³⁰ *Alice Corp. Pty. v. CLS Bank Int’l*, 134 S. Ct. 2347 (2014).

³¹ See *id.* at 2355.

³² See *id.*

recited implementation by generic computer hardware failed to supply a sufficient inventive concept.³³

But the Court's recent decisions have done more than discard the traditional limitations on patent-eligibility. The Court has also turned away from the basic rationales for subject matter exclusions articulated in its early modern cases. *Benson* and *Flook* rested in part on the rationale that the Court should await a signal from Congress, rather than approve extension of the patent system into fields not contemplated by Congress when the patent statutes were enacted.³⁴ That rationale was squarely rejected in *Chakrabarty*, where the Court emphasized that patent law by its very nature encompassed the unanticipated and unforeseeable.³⁵ *Flook* also grounded subject-matter exclusions in the theory that laws of nature and algorithms—at least algorithms that represented physical processes—were pre-existing aspects of the natural world, and not the creations of humans.³⁶ The idea that subject-matter exclusions limited the patent system to human creations also has deep roots in the philosophy of American patent law.³⁷ But *Bilski* implicitly, and *Alice* explicitly, rejected the argument that the category of abstract ideas was limited to preexisting, fundamental truths.³⁸ In place of these rationales, *Mayo* and *Alice* justified subject matter exclusions on utilitarian grounds: because fundamental principles are 'building blocks' for future work, patents on laws of nature or abstract ideas threaten to foreclose

³³ See *id.* at 2359–60.

³⁴ See *Gottschalk v. Benson*, 409 U.S. 63, 72–73 (1972); *Parker v. Flook*, 437 U.S. 584, 595–96 (1978).

³⁵ *Diamond v. Chakrabarty*, 447 U.S. 303, 315 (1980) ("*Flook* did not announce a new principle that inventions in areas not contemplated by Congress when the patent laws were enacted are unpatentable *per se*."); *cf. id.* at 319 n.2 (Brennan, J., dissenting) (citing *Flook* for proposition that Court should proceed cautiously when asked to extend patent rights into areas not foreseen by Congress).

³⁶ *Flook*, 437 U.S. at 593 n.15 ("The underlying notion is that a scientific principle, such as that expressed in respondent's algorithm, reveals a relationship that has always existed.").

³⁷ See generally Joshua D. Sarnoff, *Patent-Eligible Inventions After Bilski: History and Theory*, 63 HASTINGS L.J. 53 (2011).

³⁸ See *Alice*, 134 S. Ct. at 2356–57 (discussing *Bilski*).

more innovation than they promote.³⁹

Even as each new case has recast the test for patent eligibility, as well as its underlying rationales, the Court has maintained the pretense that all its historical and modern subject-matter cases are coherent with each other. That unfortunate tradition began largely with *Diehr*, which represented a clear rejection of *Flook*'s directive to factor "inventiveness" into the § 101 inquiry. The *Diehr* majority nonetheless maintained that its approach was entirely consistent with *Flook*—over a dissent by Justice Stevens, the author of *Flook*, who quite rightly accused the majority of disregarding *Flook* and *Benson* as well.⁴⁰ So it was quite in form for the *Mayo* Court, when it revived *Flook*'s suggestion that a claim must contain an "inventive concept" beyond an underlying law of nature or abstract idea, to insist that its holding in *Diehr* was consistent with this new test—leaving the Patent Office and the lower courts to explain why the step of opening a rubber mold was an inventive concept sufficient to transform an algorithm that calculated when the rubber in the mold was fully cured into a patent-eligible application.⁴¹

Further, while the Court has established laws of nature, natural phenomena, and abstract ideas as the basic exclusions from the patent system, the Court has declined to define those categories. *Bilski*, *Mayo*, and *Alice* simply assert that the claims at issue in each case embody a fundamental principle. Nor has the Court provided a singular definition of the "inventive concept" necessary for a patent-eligible application. Couple the Court's vagueness with the Court's pretense that all of its historic and modern subject-matter cases are consistent, and the results are predictable: while scores of patents—particularly software patents—have fallen since *Alice*, there is little or no consistency in how either the district courts or the Federal Circuit perform the § 101 analysis. For example, one of the Federal Circuit's first major post-*Alice*

³⁹ See *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1301–03 (2012); *Alice*, 134 S. Ct. at 1355.

⁴⁰ *Diamond v. Diehr*, 450 U.S. 175, 205 (1981) (Stevens, J., dissenting).

⁴¹ See 2014 Interim Guidance on Patent Subject Matter Eligibility, 79 Fed. Reg. 74,618 (Dec. 16, 2014) (to be codified at 37 C.F.R. pt. 1).

decisions, *Ulramercial v. Hulu*,⁴² seemed to conclude that a kitchen-sink approach was the safest analysis. In assessing whether the claims in suit embodied an inventive concept, the court's majority analysis invoked the notions of routine and conventional activity, steps specified at a high level of generality, the insignificance of data-gathering steps or pre-solution activity, the practical monopolization of an abstract idea, the ineffectiveness of limitations to a particular technological environment, and the machine-or-transformation test.⁴³ For good measure, the concurrence argued that *Alice* mandates a technological arts test.⁴⁴ While *Ulramercial* might hold the record for the number of tests invoked in a single opinion, one could compile an even broader collection of tests, standards, and rationales from the post-*Alice* opinions of the Federal Circuit and the district courts, and the USPTO's patent-eligibility guidelines as well.⁴⁵

III. CUTTING THE GORDIAN KNOT

There is a workable solution. It does not lie in embracing or reconciling all of the Supreme Court's statements on patent-eligible subject matter. Despite the hundreds, probably thousands of attempts in judicial opinions and academic commentaries over the last forty years, it is time to admit that the Supreme Court's opinions cannot be reconciled. Rather, the solution is to recognize the significance of the Court's reaffirmation of *Mayo* in *Alice*. For *Mayo* made three things clear. First, *Mayo* grounded subject-matter exclusions on a utilitarian rationale: fundamental principles—laws of nature, natural phenomena, and abstract ideas—are excluded because they are the “building blocks” of future advances;

⁴² 772 F.3d 709 (Fed. Cir. 2014).

⁴³ See *id.* at 715–17.

⁴⁴ See *id.* at 721 (Mayer, J., concurring).

⁴⁵ See John M. Golden, *Flook Says One Thing, Diehr Says Another: A Need for Housecleaning in the Law of Patentable Subject Matter*, 82 GEO. WASH. L. REV. 1765, 1775–76 (“[T]he main impression left by the USPTO's long but nonexhaustive list of factors is that subject-matter eligibility analysis has become a quagmire that a USPTO bound to an unwieldy set of judicial precedents will have great difficulty clearing up.”) (discussing USPTO § 101 guidelines).

monopolization of these principles by patents might tend to impede innovation more than promote it.⁴⁶ Second, *Mayo* defined the § 101 inquiry as a distinction between ineligible claims to fundamental principles themselves and claims to patent-eligible applications of those principles.⁴⁷ Third, *Mayo* held that an “inventive concept” is necessary to transform a fundamental principle into a patent-eligible application.⁴⁸ And while the Court’s subsequent opinion in *Myriad* made no reference to the “inventive concept” analytical framework, *Alice* affirmed that the two-stage inquiry suggested by *Mayo* is the framework for patent-eligibility under § 101: first, determine whether a claim is directed to a fundamental principle; second, if a claim is directed to an ineligible principle, ask whether the claim contains an “inventive concept” sufficient to transform the underlying principle into a patent-eligible application.⁴⁹ This Part argues that this two-stage inquiry should be the starting point for a pragmatic reconstruction of the test for subject-matter eligibility.

A. *Mayo’s Two-Step Test: An Unrecognized Opportunity*

Progress at this point requires some way to cut the Gordian knot of the Supreme Court’s tangled pronouncements from *Benson* to *Alice*. There is one way, short of Congressional action, that the Supreme Court’s jurisprudence could be circumvented. Assuming that the Court’s subject-matter jurisprudence represents an interpretation of § 101, rather than a constitutional limitation on the patent power,⁵⁰ then an assertion of *Chevron* authority by the USPTO could force the courts to defer to the Office’s interpretation of § 101.⁵¹ That outcome is unlikely. The Federal

⁴⁶ *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1293 (2012).

⁴⁷ *Id.* at 1293–94.

⁴⁸ *Id.* at 1294.

⁴⁹ *Alice Corp. Pty. v. CLS Bank Int’l*, 134 S. Ct. 2347, 2355 (2014).

⁵⁰ The Court has never addressed this question definitively.

⁵¹ See generally *Chevron U.S.A., Inc. v. Natural Res. Def. Council, Inc.*, 467 U.S. 837 (1984) (according deference to agency statutory interpretations); John M. Golden, *Patentable Subject Matter and Institutional Choice*, 89 TEX. L. REV. 1041, 1054–1111 (2011) (arguing for USPTO authority over subject-matter eligibility).

Circuit, at least, has held that the Office is not entitled to *Chevron* deference with respect to “substantive” requirements of the patent statutes such as § 101,⁵² and the Office’s subject-matter eligibility guidelines aim to incorporate all of the Court’s pre-*Alice* case law, as well as much of the Federal Circuit’s.⁵³

But there is another way. If there is one thing we know with certainty about patent-eligible subject matter, it is this: *Mayo*’s two-step analysis provides the framework for all § 101 determinations (except, in light of *Myriad*, claims to naturally occurring products). The significance of *Alice*’s reaffirmation of the *Mayo* two-step test has not yet been recognized. Namely, that the Court has endorsed a framework for patent-eligibility quite different from the frameworks suggested in its earlier cases. The enunciation of a new test in *Mayo* and *Alice* therefore provides a principled rationale to discount the analysis and holdings of the Court’s previous opinions, particularly *Benson*, *Flook*, and *Diehr*.

An analogy may be helpful. Suppose this were an ordinary question of constitutional law. In *Friedman v. Rogers*,⁵⁴ decided in 1979, the Supreme Court decided that a State could, consistent with the First Amendment, prohibit optometrical practices from operating under a trade name.⁵⁵ In the Court’s view, the State had legitimate interests in ensuring that a practice’s name corresponded to that of the optometrists personally practicing there,⁵⁶ this interest

⁵² See Golden, *supra* note 45, at 1045–55 (describing the lack of USPTO substantive rulemaking power); *Cooper Techs. Co. v. Dudas*, 536 F.3d 1330, 1336 (Fed. Cir. 2008) (stating that USPTO has authority only to promulgate “procedural” rules); *Animal Legal Def. Fund v. Quigg*, 932 F.2d 920, 930 (Fed. Cir. 1991) (denying that the USPTO is entitled to deference in interpretation of patentability statutes).

⁵³ See generally, 2014 Interim Guidance on Patent Subject Matter Eligibility, *supra* note 41 (attempting to reconcile current and historical precedent).

⁵⁴ 440 U.S. 1 (1979).

⁵⁵ See *id.* at 16.

⁵⁶ The Court noted that “the public may be attracted by a trade name that reflects the reputation of an optometrist no longer associated with the practice,” that the trade names might give the illusion of competition between commonly owned practices, and that a State might wish to discourage the formation of “large-scale commercial practices with numerous branch offices” by making it impossible to advertise the franchise under a common name. See *id.* at 13.

outweighed the limited commercial information conveyed to a consumer by a trade name. That is not how the case would be analyzed today. One year later, the Court adopted a four-factor test for regulation of commercial speech in *Central Hudson Gas & Electric Corp. v. Public Service Commission of New York*.⁵⁷ In the *Central Hudson* framework, speech must be actually misleading before the government may prohibit it entirely;⁵⁸ further, *Central Hudson's* framework does not simply balance the government interest against the information content of the speech. Given that *Friedman's* analytical framework has been superseded by the *Central Hudson* four-factor test, a court evaluating a restriction on trade names today might well disregard *Friedman's* holding and its analysis as well.⁵⁹

The same might be said about patent-eligible subject matter. The two-part test articulated in *Mayo* and reaffirmed in *Alice* was not the test employed by the Court in its pre-*Mayo* decisions.⁶⁰ Nor was the “building-block” focus of *Mayo* and *Alice* the exclusive or even primary rationale underlying the doctrine in the Court’s earlier cases.⁶¹ While not quite a clean slate, *Mayo's* introduction

⁵⁷ 447 U.S. 557 (1980).

⁵⁸ See *id.* at 563–64.

⁵⁹ See *Heffner v. Murphy*, 745 F.3d 56, 89 (3d Cir. 2014) (“*Friedman's* applicability and continued viability is not as clear as the Commonwealth would have us believe because the Court subsequently adopted a more detailed test for limitations on commercial speech in *Central Hudson*.”); *Alexander v. Cahill*, 598 F.3d 79, 95 (2d Cir. 2010) (“There is doubt as to *Friedman's* continued vitality. *Friedman* . . . did not employ *Central Hudson's* multi-factor First Amendment analysis.”); *Wine & Spirits Retailers, Inc. v. Rhode Island*, 481 F.3d 1, 8 (1st Cir. 2007) (noting refinement of test subsequent to *Friedman*). The Circuit Courts have reached this conclusion despite the fact that *Central Hudson* embraced *Friedman*, characterizing it as a case about misleading speech. See *Central Hudson*, 447 U.S. at 563 (citing *Friedman*, 440 U.S. at 13, 15–16).

⁶⁰ *Flook* held that an “inventive concept” was necessary to transform a mathematical algorithm into a patent-eligible application. *Parker v. Flook*, 437 U.S. 584, 594 (1977). However the *Flook* Court did not explain the meaning of “inventive concept,” because it did not find any content in the contested claims beyond mathematical calculations. See *id.* at 594–95. *Flook's* analytical device of treating the underlying principle as “a familiar part of the prior art,” *id.* at 592, does not appear in *Mayo* or *Alice*.

⁶¹ See *supra* note 34 and accompanying text. *Benson* did invoke the rationale

of a new two-step analysis in *Alice* may relieve us of the obligation to squeeze the doctrine of patent-eligibility through each and every contortion of the Court's subject-matter jurisprudence over the last forty years.

B. Pragmatic Constraints on a Jurisprudence of Patent-Eligible Subject Matter

Accordingly, this Article takes a pragmatic approach based on the foundation of *Mayo's* two-step test. Though the notion of an "inventive concept" was founded on a profound misreading of historical precedent,⁶² the *Alice* Court reaffirmed that *Mayo's* search for an "inventive concept" is the structure of the patent-eligibility inquiry.⁶³ *Mayo's* two-step analysis therefore represents an absolute constraint on a pragmatic theory of subject-matter eligibility. To that absolute constraint we may add a desirable one: a theory of subject-matter eligibility should be sensitive to the role of the judicial branch in administering the patent statutes. The Court has never definitively explained the root of its subject-matter jurisprudence. If it represents a Constitutional limitation on the exercise of Congress's power under the Patent and Copyright Clause, or a free-floating judicial doctrine (such as inequitable conduct or the doctrine of equivalents), then there are few constraints on courts' leeway to shape the doctrine. But if the patent-eligible subject matter doctrine represents an interpretation of the text of § 101, then the primary judicial role is to interpret the language "invents or discovers" in § 101 and the corresponding language "invention or discovery" in § 100.⁶⁴

that fundamental principles "are the basic tools of scientific and technological work," but as only one of several justifications for holding the claims ineligible. *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972).

⁶² See Lefstin, *supra* note 8 (manuscript at 21–22, 24, 27–28).

⁶³ See *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347, 2355 (2014).

⁶⁴ In addition, the Court seems to have rooted the exclusion of naturally occurring substances in the word "new" appearing in § 101. See *Ass'n for Molecular Pathology v. Myriad Genetics, Inc.*, 133 S. Ct. 2017, 2116 (2013) (differentiating between "naturally occurring phenomena" and a "new and useful . . . composition of matter") (quoting 35 U.S.C. § 101). The Federal Circuit has further excluded entities such as a transient signal or data structure that does not qualify as a "process, machine, manufacture, or composition of

The latter constraint, while seemingly obvious, excludes certain theories of subject-matter eligibility. Some of the most cogent arguments for subject-matter exclusions are that certain spheres of human activity should be free of worry over patent infringement.⁶⁵ However, it is not always possible to frame such exclusions in terms of “invention or discovery.” Moreover, Congress is better suited to craft tailored exceptions to the patent system—as it has done for tax strategy patents and medical practitioners.⁶⁶ Other theories of patent-eligibility have proposed individualized inquiries into whether a patent on a particular invention would fulfill the quid pro quo of the patent system and promote innovation in a particular technological environment.⁶⁷ But it is difficult to rationalize such an inquiry as a judicial interpretation of the language of §§ 100 and 101. Even if that kind of individualized inquiry fills a gap left by the primary scope doctrines—nonobviousness, enablement, and written description—we might question whether Congress has authorized the judiciary to determine whether something that is an “invention or discovery” under § 101 and meets the statutory requirements set forth in §§ 103 and 112, may nonetheless be excluded from patentability because such a patent might retard innovation.

Taking the existence of the *Mayo* two-step framework as the only absolute certainty in the subject-matter eligibility inquiry, this Article’s analysis begins with *Mayo* step two: the nature of an

matter.” See *In re Nuijten*, 500 F.3d 1346, 1357 (Fed. Cir. 2007) (transient signal); *Digitech Image Techs. v. Elecs. For Imaging, Inc.*, 758 F.3d 1344, 1350 (Fed. Cir. 2014) (data structure).

⁶⁵ See John R. Thomas, *The Patenting of the Liberal Professions*, 40 B.C. L. REV. 1139, 1175–76 (1999) (discussing effects of patents implicating professional services); see also Tun-Jen Chiang, *Competing Visions of Patentable Subject Matter*, 82 GEO. WASH. L. REV. 1858, 1873–85 (2014) (discussing moral values underlying patent-eligible subject matter debates).

⁶⁶ See Leahy-Smith America Invents Act, Pub. L. No. 112-29, § 14, 125 Stat. 284, 327–28 (2011) (deeming tax strategies to be prior art for purposes of novelty and non-obviousness); 35 U.S.C. § 287(c) (2012) (restricting remedies against medical practitioners engaged in medical or surgical procedures).

⁶⁷ See, e.g., Mark A. Lemley et al., *Life After Bilski*, 63 STAN. L. REV. 1315, 1341 (2011) (proposing a five-factor scope determination to decide subject matter eligibility).

“inventive concept.” It might seem more intuitive to begin with *Mayo* step one, by defining abstract ideas, laws of nature, and natural phenomena. However, if we desire to begin with what we know with the most certainty, we should begin with *Mayo* step two. As discussed below, *Mayo* suggests three distinct notions for the nature of “inventive concept.” Defining step two therefore requires only a choice between three relatively well-developed candidates for “inventive concept.” Moreover, beginning with step two requires fewer assumptions about the nature of excluded subject matter. Since *Benson*, the Supreme Court has consistently declined to specify what it means by “abstract ideas,” “laws of nature,” and “natural phenomena.” Beginning with a definition of fundamental principles therefore entails significant ideological and ontological commitments to the nature of the patent-eligibility doctrine at the outset. The next Part therefore examines each of the three notions of an “inventive concept” suggested by *Mayo*, at least with respect to accepted paradigm cases of fundamental principles. If we can clarify *Mayo* step two, then we may be able to return and more precisely define step one. For if the fundamental principles of step one are those things which may be transformed into patent-eligible applications by the addition of an “inventive concept,” then understanding the nature of the mill of step two may help us understand the nature of the grist of step one.

IV. CONCEPTIONS OF “INVENTIVE CONCEPT”

While the Court has not defined the “inventive concept” of *Mayo* step two, *Mayo*’s analysis presents three distinct, relatively well-defined possibilities for the “inventive concept” necessary to transform a patent-ineligible fundamental principle into a patent-eligible application. The first test suggested by *Mayo* is a test of preemption in fact: claims involving laws of nature or other fundamental principles that are “overly broad”⁶⁸ and “do not confine their reach to particular applications of those laws”⁶⁹ are not patent-eligible. Thus, we might ask whether a particular claim

⁶⁸ *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1301 (2012).

⁶⁹ *Id.* at 1302.

practically preempts all applications of an underlying law of nature, natural phenomenon, or abstract idea. Second, *Mayo* suggests a test of inventive, or non-obvious application: steps that represent “well-understood, routine, conventional activity previously engaged in by scientists in the field”⁷⁰ do not suffice to transform a law of nature into a patent-eligible application. We might therefore ask whether the patentee’s application of a fundamental principle was “inventive,” or merely an obvious implementation of the underlying principle. Finally, *Mayo* repeatedly emphasizes that, in order to transform an unpatentable principle into a patent-eligible application, a claim “must do more than simply state the law of nature while adding the words ‘apply it.’”⁷¹ If this is the test for *Mayo* step two, then a claim must be something more than a generic application: it must be more than a disclosure of a fundamental principle, coupled with a generic instruction to apply the law.

All three of these notions have been adopted for *Mayo* step two in various opinions of the Federal Circuit and the district courts since *Mayo* and *Alice*, though the courts have seldom recognized that they represent distinct choices on how to interpret the *Mayo* test. This Part evaluates the three possibilities for inventive concept in light of historical practice and policy considerations.

A. Preemptive Application

Preemption as the inquiry for *Mayo* step two was emphasized by the Federal Circuit when it heard *CLS Bank* en banc. Both major factions of the Federal Circuit in *CLS Bank* relied on preemption as the basis of their analysis. For Judge Lourie, a patent-eligible claim must include limitations that prevent the claim from covering “every practical application” of a fundamental concept;⁷² Judge Rader framed the test in identical terms.⁷³

⁷⁰ *Id.* at 1291.

⁷¹ *Id.* at 1294.

⁷² *CLS Bank Int'l v. Alice Corp. Pty., Ltd.*, 717 F.3d 1269, 1281 (Fed. Cir. 2013), *aff'd* 134 S. Ct. 2347 (2014); *see also id.* at 1287 (holding claims invalid because they would pre-empt use of method in all fields).

⁷³ *Id.* at 1300. (“It is not the breadth or narrowness of the abstract idea that is relevant but whether the claim covers every practical application of that abstract

However, of the notions of “inventive concept” set forth in *Mayo*, preemption in fact is the least consonant with historical practice. Perhaps we ought not to care about historical practice, especially if we desire to write on a clean slate. But the Supreme Court clearly does. The Court regards the nineteenth-century English hot-blast cases, and its own nineteenth-century decisions such as *O’Reilly v. Morse*,⁷⁴ as the fountainhead of the patent-eligibility doctrine. And of all the rationales the Court has invoked for excluding fundamental principles, the most consistent one is that the Court has been so doing for over 150 years.⁷⁵

Those nineteenth-century foundational cases clearly rejected the view that a patent could not effectively preempt all practical applications of a “principle,” such as a newly discovered law of nature. In England, the famous hot-blast cases stood for the doctrine that a patent might preempt all uses of a newly discovered principle, provided that the patentee’s disclosure was sufficient to enable application of the principle beyond his particular means.⁷⁶ That was the consistent understanding in the United States as well. American courts always acknowledged the unpatentability of natural principles in the abstract, but assuming the patentee to have disclosed a means of application, did not inquire whether the patent would effectively preempt all uses of a natural law.⁷⁷

idea.”).

⁷⁴ 56 U.S. 62 (1854).

⁷⁵ See *Alice Corp. Pty. Ltd. v. CLS Bank Int’l*, 134 S. Ct. 2347, 2354 (2014) (“We have interpreted § 101 and its predecessors in light of this exception [of fundamental principles] for more than 150 years.”); *Mayo*, 132 S. Ct. at 1289, 1293 (citing nineteenth century English and American cases); *Bilski v. Kappos*, 561 U.S. 593, 602 (citing *Le Roy v. Tatham*, 55 U.S. 156 (1853)).

⁷⁶ “Is it . . . an objection to the patent, that, in its application of a new principle to a certain specified result, it includes every variety of mode of applying the principle according to the general statement of the object and benefit to be obtained?” *Househill Coal & Iron Co. v. Neilson*, 1 Webster’s Patent Cases 673, 684 (Sess. 1844). According to Hope, such generality “is no objection whatever to the patent.” *Id.* See also *Jupe v. Pratt*, 1 Webster’s Patent Cases 145, 146 (Exch. Ch. 1837) (Alderson, B.) (holding that patentee who has discovered principle, and mode of carrying principle into effect, was entitled to protect “all other modes of carrying the same principle into effect”).

⁷⁷ See, e.g., *Detmold v. Reeves*, 7 F. Cas. 547, 549–50 (C.C.E.D. Pa. 1851) (“And if [the patentee] had, besides this [i.e., disclosing his discovery], devised

The Supreme Court's decision in *Morse* was not to the contrary. The Court's rejection of Morse's infamous eighth claim was based, not on the objection that Morse was attempting to preempt the use of electromagnetism, but on the objection that Morse had not enabled the use of electromagnetism for communication independent of his particular machinery.⁷⁸ The argument that *Morse* forbade practical preemption of a force of nature was raised, and squarely rejected, by the Supreme Court in 1888 in *The Telephone Cases*.⁷⁹ As noted by Professor Sarnoff,⁸⁰ contrary to Justice Douglas's assertion in *Benson*—where he suggested that Bell's claims were sustained because they did not reach "all telephonic use of electricity"⁸¹—the Court in *The Telephone Cases* was quite clear: even if Bell's claims effectively preempted all use of electricity for telephonic communication, that was not a reason to deny his claims.⁸²

The learned authorities of the mid- and late-nineteenth century were in accord, both before and after *The Telephone Cases*. As Robinson's treatise explained:

While it is true that no physical law or fact, merely as such, can be exclusively appropriated by any person, even with the aid of the patent privilege, yet if there be but one method by which that law or fact can be practically applied to useful purposes, the person who discovers and patents that one method thereby obtains complete control over the uses

some form of structure, some material arrangement by which his discovery might be applied to use, I would be most reluctant to say that his patent, properly drawn out, should be limited to the mere mechanical illustration, and could not cover effectually the whole ground of his discovery.”)

⁷⁸ See Lefstin, *supra* note 8 (manuscript at 31–33).

⁷⁹ 126 U.S. 1 (1888).

⁸⁰ See Sarnoff, *supra* note 37, at 74–75 (discussing *The Telephone Cases*).

⁸¹ *Gottschalk v. Benson*, 409 U.S. 63, 69 (1972).

⁸² *The Telephone Cases*, 126 U.S. at 535 (“We see nothing in Morse's case to defeat Bell's claim; on the contrary, it is in all respects sustained by that authority. It may be that electricity cannot be used at all for the transmission of speech except in the way Bell has discovered, and that therefore, practically, his patent gives him its exclusive use for that purpose; but that does not make his claim one for the use of electricity distinct from the particular process with which it is connected in his patent. It will, if true, show more clearly the great importance of his discovery, but it will not invalidate his patent.”).

of such fact or law.⁸³

Other nineteenth-century authors agreed that while inventors could not patent principles in the abstract, their patents could very well preempt every practical application of a fundamental principle.⁸⁴ Discussion of preemption was similarly absent in the early twentieth-century case law.⁸⁵ It was not until Justice Douglas's opinion in *Benson* that "pre-emption" emerged as a distinct consideration in the subject matter inquiry.⁸⁶

Regardless of historical antecedents, *Mayo*—while justifying subject matter exclusions on grounds of preemption—suggests that policy concerns over preemption are analytically secondary to the test of exclusion. The *Mayo* Court declined to assess whether the patent in suit would actually preempt further innovation in the field, describing the possibility that the patent would "tie up too much future use of laws of nature" as an "underlying" concern, one that simply "reinforce[d]" the conclusion of patent-ineligibility.⁸⁷ Likewise, the Court regarded the prohibition against patenting fundamental principles as "a somewhat more easily administered proxy" for the underlying policy concerns.⁸⁸ Thus, while *Mayo* grounded subject-matter exclusions in concerns over undue

⁸³ WILLIAM C. ROBINSON, *THE LAW OF PATENTS FOR USEFUL INVENTIONS* 44 (1890)

⁸⁴ See GEORGE TICKNOR CURTIS, *A TREATISE ON THE LAW OF PATENTS FOR USEFUL INVENTIONS* 422 (4th ed. 1873) (explaining that, where patentee has invented a mode of carrying into effect a "law of natural science," all other applications of principle will infringe); HENRY CHILDS MERWIN, *THE PATENTABILITY OF INVENTIONS* 530 (1883) ("[I]f, in other words, it is impossible to apply the principle without using the gist of the process patented, then the patent practically covers every application of the principle.").

⁸⁵ See Lefstin, *supra* note 8 (manuscript at 45–59).

⁸⁶ The Solicitor's brief in *Benson* framed the case as a "mental process[]" case, and led with the argument that only a "pragmatic application" of an idea was patent eligible. Brief for the Petitioner at *17–18, *Gottschalk v. Benson*, 409 U.S. 63, 71–72 (1972) (No. 71-485), 1972 WL 137527. However, the Solicitor suggested, based on *Morse*, that only claims confined to "the application of the method to a specified field of technology" and "a particular type of apparatus or hardware" were patent eligible. See *id.* at *23–24.

⁸⁷ *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1302 (2012).

⁸⁸ *Id.* at 1303.

preemption, the Court's analysis indicates that preemption itself should not be the focus of step two.

The Court likely de-emphasized preemption because it foresaw that a test of preemption in fact would often be only a minor obstacle to patenting a principle. If *Mayo* step two permitted patenting of any non-preemptive application, then limiting a claim to a particular application of a principle would transform the claim into a patent-eligible application. That position was denied in *Bilski's* gloss on *Flook*, where the Court held that limiting a claim to a particular technological environment or to one field of use could not by itself render an abstract idea patent-eligible.⁸⁹ And indeed, for those post-*Alice* courts that have adopted a test of preemptive application, that contradiction has forced them to abandon preemption as a test when the patentee argues for the patent-eligibility of narrower dependent claims.

For example, the district court in *Money Suite v. 21st Century Insurance*⁹⁰ defined *Mayo* step two as a preemption analysis⁹¹ and denied that novelty of implementation was relevant to the § 101 analysis.⁹² But when the patentee argued that some of the dependent claims were valid because they imposed particular limitations on the implementation of the underlying idea, the court rejected the attempt on the grounds that the narrowing limitations were "conventional" and not "inventive."⁹³ In the end, the *Money Suite* court was forced to conclude that "ideas that do not preempt an entire field" could nonetheless fail a test of preemption.⁹⁴ Other courts focusing on preemption have concluded that if an idea can be applied only in one field, such as network technology, then a patent claiming that idea by definition preempts all practical applications of that idea.⁹⁵ Such logic leads to the anomalous result

⁸⁹ *Bilski v. Kappos*, 561 U.S. 593, 610–13 (2010) (citing *Parker v. Flook*, 437 U.S. 584, 585–94 (1977); *Diamond v. Diehr*, 450 U.S. 175, 177–93 (1980)).

⁹⁰ No. 13-984-GMS, 2015 WL 436160 (D. Del. Jan. 27, 2015).

⁹¹ *Id.* at *4.

⁹² *Id.* at *3.

⁹³ *Id.* at *4.

⁹⁴ *Id.* at *5.

⁹⁵ *Amdocs (Israel) Ltd. v. Openet Telecom, Inc.*, No. 1:10cv910 (LMB/TRJ), 2014 WL 5430956 at *4–6 (E.D. Va. Oct. 24, 2014).

that the more narrowly defined an abstract idea is, the more likely a claim to its application will be preemptive and therefore patent-ineligible.

Preemption in fact is therefore not a viable candidate for the role of inventive concept. Besides lacking historical foundation, it runs afoul of the Court's repeated admonitions that mere narrowness of application cannot confer patent-eligibility on a claim. And even if we ignore those admonitions, it would seem difficult to distinguish "undue" preemption from the "ordinary" preemption of the public use of inventions accepted as the social cost of the patent system.

B. *Inventive Application*

The second notion of "inventive concept" articulated in *Mayo* is that of inventive, or non-obvious application. If the underlying concern of subject matter exclusions is that patents covering fundamental principles could foreclose more innovation than they promote,⁹⁶ then a test of inventive application seems a roundabout way of guarding against undue preemption. Justice Breyer's opinion nonetheless links the test of inventive application to the concern of preemption, arguing that a requirement for "something else" beyond the conventional and obvious will preclude claims from practically monopolizing a fundamental principle.⁹⁷ But there is no necessary connection between the two: an application that is inventive might nonetheless be the only practical way to apply a new discovery. Conversely, there will always be innumerable modes of appending conventional and obvious activity that have virtually no preemptive effect.

Inventive application has a slightly more credible historical pedigree than preemption, but not by much. *Mayo* drew the notion of inventive application directly from *Flook*, where Justice Stevens originated the very notion of "inventive concept." Justice Stevens

⁹⁶ See *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1293, 1301–02 (2012) (arguing that subject matter exclusion serves utilitarian ends).

⁹⁷ See, e.g., *id.* at 1299 (explaining that in *Diehr*, non-obvious or unconventional steps in a claim meant that the patentee did not seek to preempt all use of the Arrhenius equation).

observed, "Even though a phenomenon of nature or mathematical formula may be well known, an inventive application of the principle may be patented. Conversely, the discovery of such a phenomenon cannot support a patent unless there is some other inventive concept in its application."⁹⁸

Flook, however, founded the idea of inventive application in part on a severe misunderstanding of the hot-blast cases. Contrary to Justice Stevens's assertion in *Flook*, neither English nor American patent law had endorsed a test of inventive application for discoveries prior to 1948.⁹⁹ For it was then, in Justice Douglas's opinion in *Funk*, that the Court held, in the context of a claim to a composition of matter, that the discovery of a natural phenomenon could not support a patent unless there was "invention" in the means by which the patentee applied that discovery to practical use. *Funk* represented a radical break from the course of patent law up to that point. Beginning with the hot-blast cases, it was black-letter law in both the English and American systems that practical applications of new discoveries were patent-eligible without any requirement for novelty or invention in the means of application.¹⁰⁰ The Supreme Court's decisions up to that point, the decisions of the lower courts in the nineteenth and early twentieth centuries, the authoritative patent treatises, and lay descriptions of the patent system all made clear before *Funk* that a new discovery applied through known and conventional means was proper subject matter for a patent.¹⁰¹

Few courts took up *Funk*'s holding that only inventive applications of fundamental principles were patent-eligible. In large part, this was because *Funk* was phrased in terms of the notoriously amorphous and non-statutory requirement of "invention." Just four years after *Funk*, the 1952 Patent Act would replace "invention" with the seemingly more strictly defined categories of patent-eligible subject matter in § 101 and non-obviousness in § 103; spanning both concepts, *Funk*'s doctrine was

⁹⁸ *Parker v. Flook*, 437 U.S. 584, 594 (1977).

⁹⁹ See Lefstin, *supra* note 8 (manuscript at 58-59).

¹⁰⁰ See *id.*

¹⁰¹ See *id.*

not easily classified into one or the other. And though *Flook* based its notion of an “inventive concept” on *Funk*, *Diehr*’s repudiation of *Flook* three years later ended discussion of “inventive concept” until its revival in *Mayo*.¹⁰²

However, the decisions of those courts that did follow *Funk*’s test of inventive application provide very good illustrations of why inventive application should not be the general standard for *Mayo* step two. Courts that took *Funk* at face value in the 1950s and 1960s asked whether the claimed invention was obvious once the patentee’s discovery was treated as part of the prior art.¹⁰³ Seemingly inoffensive claims such as an improved process of producing silica gel;¹⁰⁴ a method of electrostatic welding,¹⁰⁵ and the optimization of a process for making a lead/lead oxide suspension¹⁰⁶ were all invalidated because the inventions became obvious once the patentee’s discovery was assumed away. In the pinnacle of that line of cases, *Armour Pharmaceutical Co. v. Richardson-Merrell, Inc.*,¹⁰⁷ the Third Circuit invalidated a claim to a novel pharmaceutical composition coated to survive transit through the stomach. There had been no reason to make such a composition before the patentee unexpectedly discovered that the pharmaceutical in question could be absorbed by the small intestine. But, under *Funk*, the fact that the small intestine would absorb the drug was a phenomenon of nature; once that discovery was assumed away, it was not inventive to use conventional coatings to ensure that the drug would reach the small intestine intact.¹⁰⁸

¹⁰² The Court’s quotation of *Funk* in *Chakrabarty*, from that part of the opinion where Douglas noted that the patentee had not altered the structure of the claimed bacteria, also encouraged the mistaken perception that *Funk* (and *Chakrabarty* itself) were ‘product of nature’ cases. See *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980).

¹⁰³ See Lefstin, *supra* note 8 (manuscript 71–75).

¹⁰⁴ *Davison Chem. Corp. v. Joliet Chems., Inc.*, 179 F.2d 793, 795 (7th Cir. 1950).

¹⁰⁵ *In re Arnold*, 185 F.2d 686, 774–75 (C.C.P.A. 1950).

¹⁰⁶ *Nat’l Lead Co. v. W. Lead Prods. Co.*, 324 F.2d 539, 544–46 (9th Cir. 1963).

¹⁰⁷ 396 F.2d 70 (3d Cir. 1968).

¹⁰⁸ *Id.* at 74 (“Once nature’s secret that the ileum would absorb trypsin was

Besides illustrating the pitfalls of inventive application as a test of patent-eligible subject matter, the historical record provides another reason to reject inventive application as the general test for *Mayo* step two. *Mayo*, based in part on the same mistaken interpretation of the hot-blast cases taken in *Flook*, assumed that, under long-standing historical practice, something beyond practical application had been required to render a fundamental principle patent-eligible. To grant protection to the diagnostic in *Mayo* would be to grant “increased protection for diagnostic laws of nature,”¹⁰⁹ which would be a departure from “general legal rules.”¹¹⁰ But the historical record teaches that, excepting *Funk* and the handful of cases applying it, American patent law has held that all practical applications of laws of nature were patent-eligible.¹¹¹

To impose a test of inventive application as the general standard of patent-eligibility would therefore represent a significant restriction on the scope of patent-eligible subject matter, as compared to the historical extent of the patent system. Lacking empirical data, it is difficult to say whether the historical scope of patent-eligible subject matter was optimal, or whether it should be restricted or expanded. But we can ask whether there has been any fundamental change in the relationship between the patent system and the process of technological advancement that would justify a departure from the historical standard of patent-eligibility. There does not appear to be any such discontinuity, at least with respect to “laws of nature” and “natural phenomena.” Technologically, the only reason why an invention like the one in *Mayo* could not have been made in the nineteenth century is the incremental advances in analytical chemistry made since that time; there is no technological discontinuity that would suggest that the

uncovered, any artisan would have known the process of enterically coating the trypsin to enable it to pass through the acidic environment of the stomach and continue into the ileum.”)

¹⁰⁹ *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1305 (2012) (emphasis added).

¹¹⁰ *Id.*

¹¹¹ Subject to the limitations imposed by the technological arts, mental steps, and printed matter doctrines, as well as the other statutory conditions of patentability.

boundaries of the patent system need to be redefined.¹¹²

In summary, at least for those kinds of inventions traditionally within the domain of the patent system, a requirement of inventive application for patent-eligibility seems misplaced. Patent law experimented with such a standard in the wake of *Funk*, and the results were not inspiring. While discoveries in the abstract have always been unpatentable, absent some change in the basic relationship between scientific discovery and technological advancement, there is little reason to impose new eligibility restrictions on inventions arising from basic discoveries.

C. Generic Application

The third notion of “inventive concept” that appears in *Mayo* is the idea that a claim must represent something more than a generic instruction to apply a fundamental principle. In particular, *Mayo* emphasizes that one cannot transform a law of nature into a patent-eligible application by simply disclosing the law of nature and adding the words “apply it.”¹¹³ Justice Breyer explained that Einstein could not have patented $E=mc^2$ by a claim that did no more than instruct one to refer to the equation in order to determine the relationship between mass and energy; nor could Archimedes have patented his principle of buoyant force by a claim that simply told boat builders to refer to that principle to determine whether an object will float.¹¹⁴ According to Justice Breyer, the claims in *Mayo* likewise represented “nothing significantly more than an instruction to doctors to apply the applicable laws when treating their patients.”¹¹⁵

¹¹² Whether diagnostic methods should be eligible for patents is another question; like the question of patents deriving from the human genome, if the patentability of diagnostic methods raises particular concerns, those concerns are not about the basic relationship between discovery and patentability. The deciphering of the human genome might be the best candidate for a technological discontinuity, but the concerns from genomic patents (which transcend the purely utilitarian) are best addressed by tailored solutions, rather than a redefinition of the relationship between discovery and the patent system.

¹¹³ *Mayo*, 132 S. Ct. at 1294; see also *id.* at 1297.

¹¹⁴ *Id.* at 1297.

¹¹⁵ *Id.* at 1298.

While the themes of preemption, inventive application, and generic application were all represented in *Mayo*, generic application became the predominant theme in *Alice*. As in *Mayo*, the *Alice* court identified the risk of disproportionate preemption as the justification for subject matter exclusions,¹¹⁶ but in the application of *Mayo* step two, Justice Thomas described preemption as the concern that “drives” or “undergirds” the Court’s § 101 jurisprudence, rather than the operational test.¹¹⁷ With respect to inventive application, *Alice* did disparage the patentee’s computer implementation as “well-understood, routine, conventional activit[ies]” previously known to the industry,¹¹⁸ but the word *obvious* is conspicuously absent from *Alice*. Also absent from *Alice* is *Mayo*’s confession that the subject-matter and novelty inquiries of §§ 101 and 102 might sometimes overlap.¹¹⁹

The de-emphasis of preemption and inventive application in *Alice* extends to its characterization of the Court’s prior precedents. In *Mayo*, the Court presented *Benson* as standing for the prohibition against claims “that too broadly preempt the use of a natural law.”¹²⁰ In *Alice*, however, the Court treated *Benson* as standing for the doctrine that merely implementing a mathematical principle on a physical machine is insufficient to transform the principle into a patent-eligible application.¹²¹ In *Mayo*, *Flook* provided the doctrine that purely “conventional or obvious” activity cannot transform a principle into an eligible application.¹²² In *Alice*, while the Court describes the implementation in *Flook* as “purely conventional” (but not *obvious*), the Court uses *Flook* instead for the proposition that limiting a claim to a particular technological environment cannot circumvent the prohibition

¹¹⁶ *Alice Corp. Pty. Ltd. v. CLS Bank Int’l*, 134 S. Ct. 2347, 2344–45 (2014).

¹¹⁷ *Id.* at 2354, 2358.

¹¹⁸ *Id.* at 2359 (quoting *Mayo*, 132 S. Ct. at 1294).

¹¹⁹ *Mayo*, 132 S. Ct. at 1304 (“We recognize that, in evaluating the significance of additional steps, the § 101 patent-eligibility inquiry and, say, the § 102 novelty inquiry might sometimes overlap.”).

¹²⁰ *Id.* at 1294 (citing *Gottschalk v. Benson*, 409 U.S. 63, 71–72 (1972)).

¹²¹ *Alice*, 134 S. Ct. at 2357.

¹²² *Mayo*, 132 S. Ct. at 1298–99.

against patenting abstract ideas.¹²³

The emphasis on generic application is most apparent in *Alice*'s application of step two. Though Justice Thomas does label the implementation "routine" and "conventional," the emphasis is not on preemptive application or inventive application, but generic application. The Court described its holding in short:

We hold that the claims at issue are drawn to the abstract idea of intermediated settlement, and that merely requiring *generic* computer implementation fails to transform that abstract idea into a patent-eligible invention.¹²⁴

And summarizing the Court's precedent:

These cases demonstrate that the mere recitation of a *generic* computer cannot transform a patent-ineligible abstract idea into a patent-eligible invention. Stating an abstract idea "while adding the words 'apply it'" is not enough for patent eligibility.¹²⁵

And, as for the application of step two:

The claims at issue amount to "nothing significantly more" than an instruction to apply the abstract idea of intermediated settlement using some unspecified, *generic* computer.¹²⁶

A standard of generic application, rather than preemptive application or inventive application, is clearly the dominant theme in *Alice*.

As a candidate for step two, generic application seems closest to the historical boundary line between abstract ideas and practical application. The demands of both English and American courts, that the patentee disclose particular means by which a new principle could be applied, seem not very far removed from the

¹²³ *Alice*, 134 S. Ct. at 2358.

¹²⁴ *Id.* at 2352 (emphasis added). The Court concluded that "the method claims, which merely require generic computer implementation, fail to transform that abstract idea into a patent-eligible invention." *Id.* at 2357.

¹²⁵ *Id.* at 2358 (emphasis added) (quoting *Mayo*, 132 S. Ct. at 1294).

¹²⁶ *Id.* at 2360 (emphasis added) (quoting *Mayo*, 132 S. Ct. at 1298); *see also id.* at 2359 ("In short, each step does no more than require a generic computer to perform generic computer functions."); *id.* at 2359 ("Viewed as a whole, petitioner's method claims simply recite the concept of intermediated settlement as performed by a generic computer."); *id.* at 2360 ("The method claims recite the abstract idea implemented on a generic computer; the system claims recite a handful of generic computer components configured to implement the same idea.").

demand in *Mayo* and *Alice* that the patentee do more than state a principle and append the words "apply it."

We could, if we were so inclined, even understand *Funk* as a generic application case. In *Funk*, the patentee had merely discovered that non-inhibitive bacteria existed. Bond's specification made clear that he had not discovered what was behind the phenomenon of non-inhibition, nor any way, short of combination itself, to identify compatible bacteria.¹²⁷ Yet his claims embraced all compatible bacteria, whether known or unknown; the patentee claimed essentially all bacterial inoculants in which the bacteria were compatible.¹²⁸

One way of looking at *Funk* is that the patentee merely disclosed an abstract natural phenomenon—the existence of compatible strains—and attempted to claim the generic application of such discovery. This seems to be what Justice Frankfurter had in mind when he distinguished between a particular combination of compatible strains, which he regarded as patentable, and Bond's claim, which was based solely on "the idea that there might be mutually compatible strains."¹²⁹ Thus, while Justice Douglas's opinion faulted the non-inventiveness of Bond's application, Justice Frankfurter arguably concluded that Bond's claim represented nothing more than a statement of a natural

¹²⁷ The patent specification in *Funk* stated:

The organisms of the genus *Rhizobium* which are mutually noninhibitive may be designated by the term alpha. No method has been observed whereby the alpha strains of the organisms may be differentiated from the mutually inhibitive group of *Rhizobia* other than by making actual nitrogen fixation tests by inoculating the various plant hosts with the proposed mixture of the *Rhizobia*.

U.S. Patent No. 2,200,532 p. 5 col. 1 ll. 36–44 (filed Aug. 24, 1938).

¹²⁸ The patent claimed, *inter alia*:

An inoculant for leguminous plants comprising a plurality of selected mutually non-inhibitive strains of different species of bacteria of the genus *Rhizobium*, the bacteria of each strain being present in numbers of substantially the same order of magnitude, said strains being unaffected by each other in respect to their ability to fix nitrogen in the leguminous plant for which they are specific.

Id. p. 7 col. 1 ll. 39–45 (claim 4).

¹²⁹ *Funk Bros. Seed Co. v. Kalo Co.*, 337 U.S. 127, 133 (1948) (Frankfurter, J., concurring).

phenomenon coupled with the instruction to “apply it.”

The third test suggested by *Mayo* is therefore a test of non-generic application. To be patent-eligible, a claim must do more than set forth a fundamental principle and add the direction ‘apply it;’ something more than steps “specified at a high level of generality”¹³⁰ is necessary for an inventive concept.¹³¹

V. A DIFFERENTIATED FRAMEWORK FOR *MAYO* STEP TWO

Based on historical antecedents and the Supreme Court’s distinct turn in *Alice*, it might seem that generic application should henceforth be the test dividing fundamental principles from patent-eligible applications. But there are reasons to hesitate before reaching that conclusion. For one thing, focusing entirely on generic application requires us to regard the Court’s use of “inventive,” “well-understood,” “routine,” “obvious,” “already in use,” and the like in its § 101 jurisprudence as mere surplus verbiage. We may be willing to jettison such language if we think that *Alice* rejected *Flook* and *Mayo*’s injection of “inventiveness” into the § 101 inquiry (though, as usual, paying lip service to the Court’s fiction that its precedents are consistent). However, this Part argues for a theory of inventive concept that embraces *both* inventive application and non-generic application. Namely, it argues that the test of inventive concept should be differentiated depending on the extent to which the invention in question embodies a discovery.

A. *Is a Single Test of Inventive Concept Necessary?*

Particularly since *Bilski*, the Court’s opinions have been written as if a single principle governs exclusions from the patent system: the exclusion of abstract ideas, laws of nature, and natural phenomena. Yet while the Court has suggested a unitary doctrine, there is no *a priori* reason to assume that the same concerns lie behind the exclusion of the very different kinds of fundamental

¹³⁰ *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1300 (2012).

¹³¹ Generic applications will often, but not necessarily always, be preemptive as well. See *infra* Part V.C (proposing a standard for non-generic application).

principles that have been considered in its opinions: thermodynamic or pharmacokinetic relationships;¹³² principles for organizing human economic activity, such as hedging or trusted intermediaries;¹³³ and largely mathematical constructs.¹³⁴ In very broad strokes, a concern over “undue preemption” might lie behind each of these exclusions. But the potential differences in the social costs and benefits of patent protection for each category suggests that different categories require different implementations of the subject-matter exclusion doctrine. In other words, if the similarity between the categories of excluded subject matter can be defined only in very general terms, there is no reason to demand that the detailed implementation of exclusion be similar across the excluded categories.

In effect, the Court has already admitted as much. In *Benson*, Justice Douglas indicated that the same principles governed the patent-eligibility of compositions of matter and processes.¹³⁵ Yet, in *Myriad*, where the Court considered the patent-eligibility of claims to DNA molecules derived from human genomic DNA and mRNA, the Court made no reference to any “inventive concept” or *Mayo*’s two-step framework. While Justice Thomas did describe the isolation and purification of human gene sequences as “not an act of invention,”¹³⁶ his opinion rests on the conclusion that isolated gene sequences are not *new* compositions of matter, as recited in § 101.¹³⁷ Likewise, in concluding that cDNAs¹³⁸ are patent-eligible, Thomas does so, not because they embody an “inventive concept” beyond the natural phenomenon—a test which

¹³² See *Diamond v. Diehr*, 450 U.S. 175 (1980); *Mayo*, 132 S. Ct. 1289.

¹³³ See *Bilski v. Kappos*, 561 U.S. 593 (2010); *Alice Corp. Pty. Ltd. v. CLS Bank Int’l*, 134 S. Ct. 2347 (2014).

¹³⁴ See *Gottschalk v. Benson*, 409 U.S. 63 (1972); *Parker v. Flook*, 437 U.S. 584 (1977).

¹³⁵ *Benson*, 409 U.S. at 67–68.

¹³⁶ *Ass’n for Molecular Pathology v. Myriad Genetics, Inc.*, 133 S. Ct. 2017, 2117 (2013).

¹³⁷ *Id.*

¹³⁸ cDNAs are laboratory-created DNA copies of naturally occurring messenger RNA molecules, carrying the protein-coding information of human genes. See *id.* at 2112.

would almost certainly have rendered them patent-ineligible¹³⁹—but because cDNA does not exist in nature.¹⁴⁰ So, while the Court rationalized its decision with *Mayo*'s “building-block” concern,¹⁴¹ the Court's test for exclusion of products derived from natural sources does not invoke *Mayo*'s notion of “inventive concept.”

B. Kinds of Abstractions: Observational and Non-Observational Inventions

Before examining how a differentiated *Mayo* step two might operate, it is necessary to define at least a preliminary ontology of those entities that might be classified as fundamental principles in *Mayo* step one. Given that *concrete* natural phenomena, such as naturally occurring substances, are, per *Myriad*, not the subjects of the *Mayo* framework, I define the domain of the *Mayo/Alice* test as *abstractions* in general, including what are commonly termed “laws of nature” and “abstract ideas.”

Of course, all claims are abstractions in some sense of the word; that is, a claim defines a set (or other type of category¹⁴²) of possible objects or processes sharing the properties enumerated by the claim, rather than a particular physical instantiation of an object or process. But, obviously, that cannot be what we mean when we exclude abstractions from patent-eligibility. Rather, given that the purpose of *Mayo* step two is to identify patent-eligible applications of fundamental principles, the subjects of *Mayo* step one are those things which themselves cannot be applications. They are abstractions in the older patent law sense of the word: an idea or principle behind the claimed invention, which represents a practical application of that idea.

¹³⁹ There was no contention in the case that the act of copying naturally occurring RNA into synthetic cDNA was “inventive” at the time the inventions were made; such operations were routine and conventional at the time. *Id.*

¹⁴⁰ See *id.* at 2119 (“[T]he lab technician unquestionably creates something new when cDNA is made.”).

¹⁴¹ *Id.* at 2116.

¹⁴² See Andrew Chin, *The Ontological Function of the Patent Document*, 74 U. PITT. L. REV. 263, 304 (2012) (regarding claims as mereological sums or fusions of their embodiments).

Without attempting to rigorously define abstractions,¹⁴³ we might begin by identifying two basic categories of abstractions. First, there is static information, including both facts about the natural world discovered by observation and invariant patterns and processes generated by humans. Second, there are decision-making processes, encompassing both those based on relationships discovered by observation and those not based on discovery from observation. The distinction between static information and decision-making processes is for illustrative purposes only, and has no doctrinal significance. For the theory articulated in this Article, the operative distinction is the further distinction drawn in each category: between those facts and decision-making processes discovered by observation—particularly observation of the natural world—and those facts or decision-making processes that are not the product of observation. Observation-based principles, generally corresponding to the conventional “laws of nature,” should be subject to a test of non-generic application for patent-eligibility. Principles not based on observation, generally corresponding to conventional “abstract ideas,” should be subject to a test of inventive application.

The rationale for such a distinction comes from a view of the patent system articulated by Professor Merges: the patent system should ideally function to incentivize inventions whose development entails significant uncertainty and risk.¹⁴⁴ The critical insight is that research and development leading to potentially patentable inventions is often conducted under conditions where the innovator does not know whether a commercially successful product will result.¹⁴⁵ Premised on the notion that the grant of patents should be restricted to those inventions whose development would not be undertaken without the rewards provided by a patent, Merges concluded that the social benefits of the patent system are greatest when patents are withheld for “research with a high

¹⁴³ For an exploration of the potential meanings of “abstract idea,” see Kevin Emerson Collins, *Bilski and the Ambiguity of “An Unpatentable Abstract Idea.”* 15 LEWIS & CLARK L. REV. 37 (2011).

¹⁴⁴ Robert P. Merges, *Uncertainty and the Standard of Patentability*, 7 HIGH TECH. L.J. 1 (1992).

¹⁴⁵ See *id.* at 23.

probability of promising results.”¹⁴⁶ From modeling of the decision-making process followed by inventors, Merges argued that the level of uncertainty faced by the inventor—in particular, the uncertainty at the time just prior to the final experiment that leads to the development of a patentable invention—should be the key factor in the system’s decision whether or not to award a patent.¹⁴⁷

Merges’s argument is that the uncertainty and risk associated with development should be the basic principle guiding the test of non-obviousness under § 103: because of the social cost of patent monopolies, § 103 should operate to restrict patents where commercial development is not associated with uncertainty and risk.¹⁴⁸ In a world where concerns over the social cost of patents are solely the domain of § 103 (and § 112),¹⁴⁹ such arguments might have no place in § 101. We are not in that world, however. The Supreme Court in *Mayo* grounded subject matter exclusions in utilitarian concerns over the social cost of patents, and overruled *sub silentio Diehr*’s warning against admixing § 102 and § 103 into the subject matter inquiry. Under these circumstances, applying Merges’s insight to the subject matter inquiry may help clarify the appropriate test for *Mayo* step two.

The premise, therefore, of the distinction between observation-based inventions (especially those based on observations of the natural world) and those not based on observation is that the former are more likely to be subject to uncertainty and risk in development than the latter. A prototypical “law of nature” invention, almost by definition, is based on the discovery of an unknown: in *Mayo*, the alleged discovery of the relationship between 6-thioguanine levels and therapeutic effectiveness. In contrast, the prototypical “abstract idea” invention—such as the business methods in *Bilski* and *Alice*—is not based upon the discovery of a previously unknown principle.

¹⁴⁶ *Id.* at 29. Merges argued that probability of *commercial* success should not be a factor in this consideration. *See id.* at 34.

¹⁴⁷ *See id.* at 33.

¹⁴⁸ *See id.* at 29.

¹⁴⁹ Because § 112 determines patent scope, it also controls the social cost of patent monopolies.

C. *Differentiating Inventive Application and Generic Application by Uncertainty in Development*

The analytical framework I propose for *Mayo* step two is to differentiate between “laws of nature”—prototypically discovery-based inventions—and “abstract ideas”—prototypically not discovery-based inventions. A test of generic application should be required for “laws of nature,” while an inventive application should be required for “abstract ideas.” This framework assumes that inventive applications represent a subset of non-generic applications:

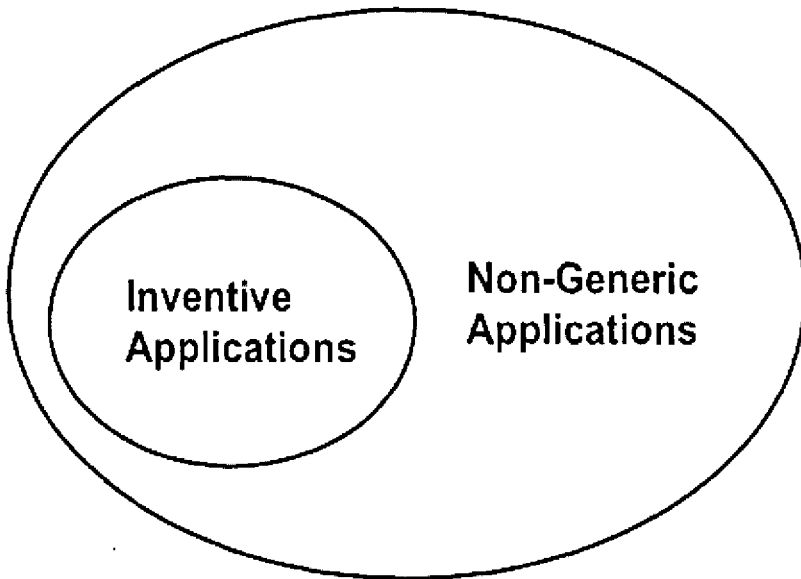


Figure 1 – Inventive Applications as a Subset of Non-Generic Applications

That is, in a claim consisting of nothing more than a statement of a fundamental principle coupled with a generic instruction to apply the principle, the instruction “apply it” cannot be inventive. However, there are many applications which are non-generic but not inventive; a claim might state a fundamental principle and further define a means of application that is specific but not “inventive” in the sense of *Funk*.

If observation-based inventions are likely subject to risk and uncertainty in their development, then there is no reason to impose an additional requirement of non-obvious “invention” for

transformation into patent-eligible applications. Moreover, as discussed above,¹⁵⁰ such inventions were historically patent-eligible, excepting *Funk* and the handful of cases that imposed *Funk*'s standard of inventive application in the 1950s and 1960s. Assuming that the patent system functioned reasonably well in the two centuries preceding *Mayo*, and assuming no fundamental change in the relationship between patentable discoveries and technological advance, there appears to be no justification for deviating from the historical standard of patent-eligibility. Hence, a standard of generic application, most similar to the historical standard of patent-eligibility, should govern discovery-based inventions.¹⁵¹

In contrast, inventions not based on observation of previously unknown facts or relationships are unlikely to face the same uncertainty in the development process. Such inventions may be subject to *commercial* uncertainty—whether they would ultimately be desired by the market—but, as Merges argues, the case for patent protection is significantly less compelling for purely commercial uncertainties than more technological ones.¹⁵² Moreover, in contrast to discovery-based inventions, there are at least theoretical justifications for deviating from the historical standard of patent-eligibility for such inventions—particularly those involving automated decision-making processes. First, before the advent of modern information technology, the patent system never grappled with the problem of automated decision-making processes. Second, many such inventions (such as the financial methods in *Bilski* and *Alice*) were historically removed from the

¹⁵⁰ See *supra* Part IV.B.

¹⁵¹ An inventor seeking the more generous treatment accorded to discovery-based inventions should be obliged to disclose and point out the discovery in question in the patent specification.

¹⁵² Merges, *supra* note 144, at 34. Merges based this distinction primarily on the value of the technological information produced and disclosed in the patent specification. First, he viewed technological information as more likely to yield positive externalities than market information. See *id.* Second, because of the value of disclosure, patents ought to reward the overcoming of technical uncertainty even if the product is a commercial failure; in contrast, a system that rewarded the overcoming of commercial uncertainty would leave the commercially unsuccessful inventor with nothing. See *id.* at 29.

patent system by the non-statutory exclusion of business methods or “mental steps.” That such inventions were not historically within the patent system does not establish that they should be excluded under § 101. However, it does suggest that our current doctrines of non-obviousness and enablement might not be suited to regulate the patentability of such inventions, because those doctrines evolved for the most part in an environment lacking those kinds of inventions.¹⁵³

In essence, what this theory proposes is a distinction between discoveries and inventions in the patent-eligibility inquiry. That distinction is not a new idea in patent law. From 1790 to the present day, the patent statutes have provided that one who has invented *or* discovered one of the enumerated subject-matter classes is eligible to receive a patent.¹⁵⁴ In the nineteenth century, the distinction had significance. In *Burr v. Duryee*,¹⁵⁵ Justice Grier distinguished “discoveries”—“new application[s] of certain natural forces to produce a certain result to which they had never before been applied”¹⁵⁶—from simple inventions, such as the “mere combination of certain mechanical devices to produce a desired manufacture in a cheaper or better manner.”¹⁵⁷ For the category of discoveries, no ‘invention’ in the means of application was necessary; such inventions were patentable, even though “no skill or invention” was necessary to devise applications once the discovery was pointed out.¹⁵⁸ The same distinction was the basis of Merwin’s 1883 treatise. As he explained, most patents were granted for “inventions,” which operated according to known laws

¹⁵³ Much in the same way that inhabitants of an ecosystem evolved to a state of equilibrium may be ill-equipped to deal with the introduction of new kinds of organisms.

¹⁵⁴ Compare Patent Act of 1790, Ch. 7, 1 Stat. 109-112 (April 10, 1790) (providing that patents should be granted to persons who “have invented or discovered any useful art, manufacture, engine, machine, or device, or any improvement therein . . .”) with 35 U.S.C. § 101 (2012) (“Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof . . .”).

¹⁵⁵ 68 U.S. 531 (1863).

¹⁵⁶ *Id.* at 568.

¹⁵⁷ *Id.*

¹⁵⁸ *Id.* at 569.

or familiar properties of matter.¹⁵⁹ In such cases, mere novelty would not suffice; patentability demanded the additional quality of “invention.”¹⁶⁰ On the other hand, for “discoveries,” based on a newly discovered law of nature or property of matter, practical application was sufficient. The means of application in such cases might well be “devoid of all invention,” and apparent to one skilled in the art upon disclosure of the discovery.¹⁶¹

If we are to distinguish in *Mayo* step two between observation-based “discoveries,” subject to a test of generic application, and non-observation based “inventions,” subject to a test of inventive application, how would such tests operate? In the case of prototypical “natural laws,” an application that merely reveals the underlying observation would amount to nothing more than an instruction to “apply it.” So, for example, a claim directed solely to a method of comparing the sequence of a patient’s gene to the sequence of the wild type gene, which the Federal Circuit regarded as an unpatentable mental comparison in *In re BRCA1- and BRCA2-Based Hereditary Cancer Test Patent*,¹⁶² might be more accurately characterized as a claim based solely on the underlying natural phenomenon: the sequence of a particular human gene.¹⁶³ In contrast, for a case like *Ariosa v. Sequenom*,¹⁶⁴

¹⁵⁹ HENRY CHILDS MERWIN, *THE PATENTABILITY OF INVENTIONS* 3 (1883).

¹⁶⁰ *See id.*

¹⁶¹ *Id.* at 4.

¹⁶² 774 F.3d 755 (Fed. Cir. 2014). A representative claim, rewritten to include the limitations of the independent claim from which it depended, was:

A method for screening germline of a human subject for an alteration of a BRCA1 gene which comprises comparing germline sequence of a BRCA1 gene or BRCA1 RNA from a tissue sample from said subject or a sequence of BRCA1 cDNA made from mRNA from said sample with germline sequences of wild-type BRCA1 gene, wild-type BRCA1 RNA or wild-type BRCA1 cDNA, wherein a difference in the sequence of the BRCA1 gene, BRCA1 RNA or BRCA1 cDNA of the subject from wild-type indicates an alteration in the BRCA1 gene in said subject[,] wherein a germline nucleic acid sequence is compared by amplifying all or part of a BRCA1 gene from said sample using a set of primers to produce amplified nucleic acids and sequencing the amplified nucleic acids.

Id. at 761.

¹⁶³ Or a relationship between a gene sequence and the incidence of breast

where the underlying discovery was the presence of cell-free fetal DNA in the maternal bloodstream, the use of such DNA to screen for a particular paternally-inherited genetic defect—while not inventive over the discovery—represents something more than revealing the underlying natural phenomenon: the general existence of cell-free fetal DNA.¹⁶⁵ Similarly, in the case of observed relationships, the claims in *Mayo* recited nothing more than the revelation of the underlying relationship, between 6-thioguanine levels and therapeutic effectiveness.¹⁶⁶ A claim further reciting therapeutic steps—possibly, nothing more than adjusting the drug dosage—would constitute more than revealing the underlying relationship and therefore something more than a generic application.¹⁶⁷

What of inventions based on discoveries in the social sciences, such as human psychology, or even economics? While such inventions were not historically within the patent system, they would be patent-eligible, subject to a test of generic application, under the framework articulated here. Given that *Bilski* rejected a technological arts test, there appears no principled reason to limit discovery-based inventions to the physical or biological sciences.

cancer; again, the distinction between ‘facts’ and ‘relationships’ is illustrative only.

¹⁶⁴ 19 F. Supp. 3d 938 (N.D. Cal. 2013).

¹⁶⁵ Similarly, in a case like *Armour Pharmaceutical*, where the underlying observation was the ability of the small intestine to absorb trypsin, an enteric-coated trypsin formulation may have been obvious in light of the discovery, but is not the mere revelation of the underlying fact.

¹⁶⁶ See *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1296–98 (2012). Likewise, in a case like *Genetic Veterinary Sciences, Inc. v. Canine EIC Genetics, LLC*, No. 14–1598 (JRT/JJK), 2015 WL 1505669 (D. Minn. Mar. 31, 2015), the grounds of decision ought to be not that the claims require only well-known methods of genetic testing, but that the claims do nothing more than reveal the relationship between a genetic sequence and predilection for disease.

¹⁶⁷ Claims like the ones in *Davison Chemical* and *Western Lead*, where prior art processes were optimized based on the discovery of the relationship between reaction conditions and chemical state, similarly involve more than simply articulating the relationship between reaction state and product uniformity. By analogy to *Mayo*, a claim that did no more than direct the observation of reaction conditions would not be patent-eligible.

If the development of an invention based on social science is characterized by uncertainty and risk, and if the public benefits from the disclosure of the discovery underlying the claimed application, then the same rationales hold to permit non-generic applications of such discoveries to be the subject of patents. Indeed, Justice Thomas seemed to put the physical and social sciences on equal footing in *Alice*, when, rejecting the patentee's argument based on the tangibility of computers, he explained that a standard of mere physical implementation would permit a patentee to "claim any principle of the physical and social sciences by reciting a computer system configured to implement the relevant concept."¹⁶⁸ So long as *Bilski* stands for the rejection of a technological arts test, practical applications of discoveries in the social sciences should stand on the same footing as discoveries in the physical sciences.

For non-observational inventions—those based on human-generated patterns, and processes not based on observation—*Mayo* step two requires inventive application. Because inventive applications represent a subset of non-generic applications, any generic application is by definition also non-inventive. Therefore, a claim may be classified as non-patent-eligible in *Mayo* step two either by showing that the application represents nothing more than a generic instruction to "apply it" or by showing that the application requires nothing more than "'well-understood, routine, conventional activit[ies]' previously known to the industry."¹⁶⁹ Any claim reciting no more than generic computer implementation, or generic Internet implementation, clearly fails this test.

VI. ABSTRACT IDEAS RECONSIDERED: IS SOFTWARE ALWAYS AN ABSTRACTION?

Having defined a framework for step two of the *Mayo* inquiry, let us briefly return to step one. Does the analysis of step two shed light on the nature of "abstract ideas"? The easy cases are those where a general principle of organizing human activity is coupled with an instruction equivalent to "do it on a computer" or "do it on

¹⁶⁸ *Alice Corp. Pty. Ltd. v. CLS Bank Int'l.*, 134 S. Ct. 2347, 2359 (2014).

¹⁶⁹ *Id.* at 2369 (quoting *Mayo*, 132 S. Ct. at 1294).

the Internet.” According to *Bilski* and *Alice*, the modes of organizing human activity in those cases—hedging risk in the commodities market, or using a trusted intermediary to reduce settlement risk—are abstract ideas. The hard cases are those like *California Institute of Technology v. Hughes Communication*¹⁷⁰ (“*Caltech*”), which involve specific and technological information-processing claims.

The patents in *Caltech* were directed to a method of generating error correction codes in digital transmissions. They described a method of generating parity bits by accumulating previously generated parity bits, and a sum of randomly chosen irregular repeats of message bits.¹⁷¹ The broadest claims recited only the steps of receiving a message bitstream, generating parity bits according to a disclosed set of rules, and making the parity bits available for transmission.¹⁷² Under the framework described in this Article, the error-correction techniques disclosed in the patent are non-observational inventions, like the ones in *Bilski* and *Alice*, and therefore subject to a test of inventive application. But unlike *Bilski* or *Alice*, the claims define a specific information-processing technique, rather than a basic economic practice. That technique of generating and interpolating parity bits was regarded by the court as inventive over the prior art.¹⁷³

The pivotal question in *Caltech*, and perhaps for software patents more generally, is whether specific information-processing techniques are abstract ideas. If they are abstract ideas, then they are essentially unpatentable: if there is such a thing as an inventive application of a specific-information processing technique, then a claim to that application is likely so narrow as to be worthless. Certainly the claims in *Caltech* were not inventive applications of the techniques developed by the inventors. On the other hand, if the abstract idea in the contested claims was something more general than the specific technique for generating and embedding parity bits, then the specific technique represented an inventive,

¹⁷⁰ No. 2:13-cv-07245-MRP-JEM, 2014 WL 5661290 (C.D. Cal. Nov. 3, 2014).

¹⁷¹ See *id.* at *2.

¹⁷² See, e.g., U.S. Patent 7,421,032, claim 1 (filed Sept. 2, 2008).

¹⁷³ *Caltech*, 2014 WL 5661290 at *17.

and therefore patent-eligible, application of the underlying abstract idea.

In *Digitech Image Technologies v. Electronics for Imaging*,¹⁷⁴ the Federal Circuit seemingly suggested that all information-processing techniques are, by definition, abstract ideas. The claims in *Digitech* were directed to methods of generating “device profiles,” which would incorporate both color and spatial distortion properties of imaging equipment.¹⁷⁵ Based on language from *Flook*, the *Digitech* court stated “a process that employs mathematical algorithms to manipulate existing information to generate additional information is not patent eligible.”¹⁷⁶ Further, according to the court, if a patent describes “a process of organizing information through mathematical correlations and is not tied to a specific structure or machine,” then the patent claims an abstract idea.¹⁷⁷ A literal reading of *Digitech* would therefore classify all information-processing techniques, whether specific or general, as abstract ideas.

However, in *Caltech*, Judge Pfalzer of the Central District of California regarded such an interpretation of *Digitech* as incompatible with both the basic patentability of software and the Supreme Court’s sidelining of the machine-or-transformation test in *Bilski*.¹⁷⁸ The *Caltech* court instead concluded that “abstract ideas” should be defined by looking to the *purpose* of the claim, recited “at a reasonably high level of generality.”¹⁷⁹ Under this analysis, the claims in *Caltech* were directed to an abstract idea: encoding and decoding data to achieve error correction.¹⁸⁰ Nonetheless, the *application* of that idea—the use and accumulation of irregularly repeated message bits as parity bits—represented an innovative and unconventional application of the underlying idea.¹⁸¹ Hence, the asserted claims were patent-eligible.

¹⁷⁴ 758 F.3d 1344 (Fed. Cir. 2014).

¹⁷⁵ See *id.* at 1348–49.

¹⁷⁶ *Id.* at 1351.

¹⁷⁷ *Id.* at 1350.

¹⁷⁸ *Caltech*, 2014 WL 5661290 at *9.

¹⁷⁹ *Id.* at *13.

¹⁸⁰ See *id.* at *15.

¹⁸¹ See *id.* at *17. This discussion focuses on the court’s treatment of the ‘032

In light of the turn of the Supreme Court's jurisprudence in *Mayo* and *Alice*, the *Caltech* court's analysis appears to be correct for two reasons. First, *Mayo* and *Alice* reoriented the doctrine of patent-eligible subject matter by focusing on the "building-block" concern as a justification for excluding abstract ideas. *Mayo* and *Alice* teach that abstract ideas are not characterized by intangibility, nor by field of invention. Rather, abstract ideas are characterized by "preemptiveness" or "fundamentalness:" the risk that a patent on the abstract idea will unduly tie up a principle necessary for further technological advance. Whether a process is physical does not correlate with the risk that effective preemption of that principle will unduly impede innovation.¹⁸² When *Bilski* and *Alice* identified abstract ideas, they were broad concepts—such as hedging or intermediated settlement—that were described as fundamental economic practices.¹⁸³ In contrast, a particular method of generating parity bits is not a fundamental concept whose monopolization would pose any risk of impeding innovation beyond the inevitable preemption effected by any patent.¹⁸⁴

The second reason why the *Caltech* court was correct to

patent's claims, but the analysis was similar for the other patents in suit. *See id.* at *18–*20.

¹⁸² There are cogent arguments that "abstract" software patents—abstract in the sense of having vague boundaries—pose great difficulties for the patent system. *See, e.g.,* JAMES BESSEN & MICHAEL J. MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATIONS AT RISK 198–212 (2008) (describing costs of abstract patents). It may be that intangible processes pose more definitional problems than tangible ones. But given that the Supreme Court has declined to restrict patents to tangible processes, those concerns are properly addressed under § 112, not § 101.

¹⁸³ *See Alice Corp. Pty. Ltd. v. CLS Bank Int'l.*, 134 S. Ct. 2347, 2356 (2014); *Bilski v. Kappos*, 561 U.S. 593, 611 (2010).

¹⁸⁴ In *Mayo*, the Court stated that even a 'narrow' natural law with limited applications is still an ineligible fundamental principle. *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1302 (2012). But *Mayo* should not be read to mean that specificity is irrelevant to the identification of an abstract idea. It seems difficult to identify "specific abstract ideas" without equating "abstract" to "intangible," which would be contrary to *Bilski* and *Alice*. Moreover, in contrast to the limited stock of discoverable laws of nature, the stock of human-created ideas is potentially infinite. Hence, monopolization of a "narrow abstract idea" does not raise the same concerns as monopolization of a "narrow law of nature."

identify error correction, rather than the specific method of computing parity bits, as the abstract idea in the claims follows from the structure of the *Mayo/Alice* test. Step one defines the abstraction (if any) underlying the claim, while step two asks if the application of that abstraction is inventive.¹⁸⁵ The object of step one must therefore be to separate the *idea* of the invention from the *means of application*. This is hardly an unprecedented notion in patent law. For generations, courts deciding inventorship have distinguished between formulating a desired goal or result—which is not a contribution to conception—and formulating the means of attaining that result—which is a contribution to conception.¹⁸⁶ It follows that the means of implementing a particular result—even if those means are a mathematical procedure—are applications to be evaluated in *Mayo* step two, not abstractions to be evaluated in *Mayo* step one.

To the extent that *Digitech* suggests that all information-processing steps should be classified as abstract ideas, it is premised on principles that the Supreme Court itself has abandoned. The *Digitech* court based its reasoning on language from *Flook*, in which the Court—quoting from an opinion of the Court of Customs and Patent Appeals—stated that claims “directed essentially to a method of calculating” are not statutory subject matter.¹⁸⁷ However, as the *Caltech* court recognized, extrapolating that language from *Flook* to hold that all information-processing

¹⁸⁵ *Caltech*, 2014 WL 5661290 at *3. Or non-generic, in the case of a discovery-based invention.

¹⁸⁶ See, e.g., *Garrett Corp. v. United States*, 422 F.2d 874, 881 (Ct. Cl. 1970) (“One who merely suggests an idea of a result to be accomplished, rather than means of accomplishing it, is not a joint inventor.”); *Land v. Dreyer*, 155 F.2d 383, 387 (C.C.P.A. 1946) (“It is not sufficient, therefore, to show that a party claiming an invention has conceived a result to be obtained; the patentable thing is the means provided and disclosed by him to accomplish that result.”); *Bianco v. Globus Med., Inc.*, 30 F. Supp. 3d 565, 577 (E.D. Tex. 2014) (Bryson, J., sitting by designation) (“A person does not become entitled to be named as a joint inventor on a patent merely by suggesting a desired goal or result without conceiving of the means by which that goal can be attained.”) (citing *Garrett*).

¹⁸⁷ *Digitech Image Techs., LLC v. Electronics for Imaging, Inc.*, 758 F.3d 1344, 1351 (2014) (quoting *Parker v. Flook*, 437 U.S. 584, 595 (1978), in turn quoting *In re Richman*, 563 F.2d 1026, 1030 (C.C.P.A. 1977)).

claims are nonstatutory not only gives short shrift to *Diehr*, but (more significantly) is incompatible with the Court's rejection of machine-or-transformation as the definitive test for patent-eligibility in *Bilski*. *Mayo* and *Alice* emphasize that the foundation of subject matter exclusions under § 101 is not *Flook's* notion that laws of nature and mathematical formulas "always existed,"¹⁸⁸ but the risk posed by too broadly preempting fundamental principles. With this reorientation of the patent-eligibility doctrine, *Benson* and *Flook's* focus on "algorithms" is no longer relevant. *Benson* and *Flook* employed neither the rationale nor the analysis used by the Supreme Court in its opinions since *Bilski*. It is risk of preemption, and not tangibility or field of endeavor, that characterizes abstract ideas under the framework articulated by *Mayo* and *Alice*. Specific information-processing algorithms, such as the method of generating parity bits claimed in *Caltech*, should therefore be regarded as applications and not "abstract ideas" for purposes of *Mayo* step one.

In contrast to *Caltech*, in *McRO, Inc. v. Activision Publishing, Inc.*,¹⁸⁹ Judge Wu (also of the Central District of California) found a method of automatically animating lip synchronization and facial expression in digital animation to be ineligible, even though the court regarded computer animation as "a specific technological process" rather than an abstract idea.¹⁹⁰ The *McRO* court adopted what it called a "point of novelty" approach: to evaluate eligibility under § 101, a court "must factor out conventional activity."¹⁹¹ For the patents in suit, the difference between prior art synchronization methods and the claimed method was the use of preprogrammed rules, rather than the judgment of an artist, to set values representing the shape of an animated character's mouth as it pronounces particular sounds.¹⁹² But according to the court, the claim recited the use of rules without specifying what those rules

¹⁸⁸ *Flook*, 437 U.S. at 593 n.15.

¹⁸⁹ No. CV 14-336-GW(FFMx), 2014 WL 4759953 (C.D. Cal. Sept. 22, 2014).

¹⁹⁰ *Id.* at *8.

¹⁹¹ *Id.* at *9.

¹⁹² *See id.* at *10 (holding that the use of rules was the "point of novelty" differentiating the claimed method from prior art cited in the patent).

should be.¹⁹³ The claims therefore “[le]ft] an abstract idea at the point of novelty, and prevent[ed] the development of any additional ways to use that abstract idea in the relevant field.”¹⁹⁴

The *Caltech* court criticized *McRO*'s approach, arguing that the point of novelty approach was rejected by *Diehr*, and that the *McRO* analysis conflated step one and step two of the *Mayo* inquiry.¹⁹⁵ As a matter of form, those criticisms seem well-founded. Per *Alice*, the § 101 inquiry first identifies an abstract idea embodied in the claims, and secondly asks whether the application of that idea constitutes an inventive concept. To ask, as the *McRO* court did, whether “the only new part of the claim is an abstract idea,”¹⁹⁶ reverses that order: identification of an abstract idea should precede any inquiry into inventiveness.¹⁹⁷ Moreover, under the analysis advocated in this Article, preemption in fact—whether the claim leaves “additional ways to use that abstract idea in the relevant field”¹⁹⁸—should not be the focus of *Mayo* step two.

However, the substance of the *McRO* court's conclusions is consistent with *Caltech* and with the analytical framework proposed here. Most significantly, the *McRO* decision implicitly acknowledges the patent-eligibility of specific information-processing techniques. *McRO* describes three-dimensional computer animation as “tangible” and “a specific technological process.”¹⁹⁹ While not expressly challenging *Digitech* (as *Caltech* did), *McRO*'s analysis is clearly not compatible with *Digitech*'s suggestion that all information-manipulating processes are abstract ideas, unless tied to a specific machine.²⁰⁰ Further, Judge Wu's concept of “abstract idea” is not far from Judge

¹⁹³ See *id.* at *11.

¹⁹⁴ *Id.*

¹⁹⁵ See *Cal. Inst. of Tech. v. Hughes Commc'n*, No. 2:13-cv-97245-MRP-JEM, 2014 WL 5661290, at *11 (C.D. Cal. Nov. 3, 2014).

¹⁹⁶ *McRO*, 2014 WL 4759953 at *9.

¹⁹⁷ See *Ultramercial, Inc. v. Hulu, LLC*, 772 F.3d 709, 715 (Fed. Cir. 2014) (“[A]ny novelty in implementation of the idea is a factor to be considered only in the second step of the *Alice* analysis.”).

¹⁹⁸ *Id.* at *11.

¹⁹⁹ *Id.* at *8.

²⁰⁰ See *Digitech Image Techs. v. Elecs. For Imaging, Inc.*, 758 F.3d 1344, 1350–51 (Fed. Cir. 2014).

Pfaelzer's. Just as *Caltech* proposes that the abstract idea behind the claim should be equated with the claim's purpose or effect, *McRO* suggests that the abstract idea behind the claims in suit could be regarded as the idea that an animated human mouth should look a certain way when pronouncing particular sounds.²⁰¹

Under the analysis proposed in this Article, for a computational claim like the one in *McRO* to be patent-eligible, the claim must represent an inventive implementation of the underlying idea. Generic implementations, by definition, are not inventive and cannot contribute an inventive concept.²⁰² While *McRO* speaks of "point of novelty" and preemption, the core of Judge Wu's analysis is that the patentee's application was generic: "So, what the claim adds to the prior art is the use of rules, rather than artists, to set the morph weights and transitions between phonemes. However, both of these concepts are specified at the highest level of generality."²⁰³ The court's focus should have been on the application in its entirety, rather than on the novel element in the claims. But if *McRO*'s premise was that the claims represented a merely generic application (i.e., 'use rules'),²⁰⁴ then its conclusion of ineligibility was correct. Alternatively, if the court's statement equates to a finding that there was nothing inventive about the patentee's application of the underlying idea (that an animated mouth should appear a certain way when pronouncing particular sounds), then the claims are still ineligible under the more rigorous standard proposed here for inventions not based on a discovery.

VII. CONCLUSION

Mayo and *Alice* have made clear that the boundary between ineligible principle and eligible application is the addition of an

²⁰¹ See *McRO*, 2014 WL 4759953 at *8 ("Facially, these claims do not seem directed to an abstract idea. . . . They do not claim a monopoly, as Defendants argue, on 'the idea that the human mouth looks a certain way while speaking particular sounds,' 'applied to the field of animation.'") (quoting defendants' motion for judgment on the pleadings).

²⁰² See *supra* Part V.C.

²⁰³ *McRO*, 2014 WL 4759953 at *11.

²⁰⁴ See *id.* (suggesting that claims do no more than state an abstract idea and add the words 'apply it').

“inventive concept” to an underlying fundamental principle. Whether or not the Supreme Court has chosen the correct course, the *Mayo* framework represents an opportunity to disentangle the subject-matter inquiry from the contradictory muddle of the Court’s pre-*Bilski* jurisprudence. But given the heterogeneity of “fundamental principles,” it is unreasonable to expect that a single notion of “inventive concept” will draw the correct line between principle and application. Adopting separate standards for discovery-based and non-discovery-based inventions in *Mayo* step two permits a more technology-specific application of the test for patent-eligible subject matter, and turns the doctrine as a whole back towards its traditional roots.

