United States Court of Appeals for the Federal Circuit

ARIOSA DIAGNOSTICS, INC., NATERA, INC.,
Plaintiffs-Appellees

DNA DIAGNOSTICS CENTER, INC.,
Counterclaim Defendant-Appellee

v.

SEQUENOM, INC., SEQUENOM CENTER FOR MOLECULAR MEDICINE, LLC,
Defendants-Appellants

ISIS INNOVATION LIMITED,
Defendant

2014-1139, 2014-1144

Appeals from the United States District Court for the Northern District of California in Nos. 3:11-cv-06391-SI, 3:12-cv-00132-SI, Judge Susan Y. Illston.

ON PETITION FOR REHEARING EN BANC

MICHAEL J. MALECEK, Kaye Scholer LLP, Palo Alto, CA, filed a petition for rehearing en banc for defendants-appellants. Also represented by PETER E. ROOT; ATON ARBISSER, Los Angeles, CA; THOMAS GOLDSTEIN, ERIC F. CITRON, Goldstein & Russell, P.C., Bethesda, MD.

DAVID ISAAC GINDLER, Irell & Manella LLP, Los Angeles, CA, filed a response to the petition for plaintiff-appellee Ariosa Diagnostics, Inc. Also represented by ANDREI IANCU, JOSHUA GORDON; AMIR NAINI, Russ August & Kabat, Los Angeles, CA.

MARK ANDREW PERRY, Gibson, Dunn & Crutcher LLP, Washington, DC, filed a response to the petition for plaintiff-appellee Natera, Inc. Also represented by TRACEY B. DAVIES, BRETT ROSENTHAL, MICHAEL A. VALEK, Dallas, TX.

WILLIAM PAUL SCHUCK, Bartko, Zankel, Bunzel & Miller, San Francisco, CA, for counterclaim defendant-appellee DNA Diagnostics Center, Inc.

GIDEON A. SCHOR, Wilson Sonsini Goodrich & Rosati, PC, New York, NY, for amici curiae Amarantus Bioscience Holdings, Inc., Personalis, Inc., Population Diagnostics, Inc. Also represented by MAYA SKUBATCH, Palo Alto, CA; RICHARD TORCZON, CHARLES J. ANDRES, JR., Washington, DC.

LANA GLADSTEIN, Nutter McClennen & Fish LLP, Boston, MA, for amicus curiae Bioindustry Association. Also represented by KONSTANTIN M. LINNIK, ISAAC A. HUBNER.

CHRISTOPHER MICHAEL HOLMAN, University of Missouri-Kansas City, Kansas City, MO, for amici curiae Biotechnology Industry Organization, Pharmaceutical Research and Manufacturers of America. Biotechnology Industry Organization also represented by BRIAN P. BARRETT, Eli Lilly and Company, Indianapolis, IN; LI WESTERLUND, Bavarian Nordic, Inc., Redwood City, CA.

BENJAMIN JACKSON, Myriad Genetics, Inc., Salt Lake City, UT, for amicus curiae The Coalition for 21st Century Medicine. Also represented by DAVID CARTER HOFFMAN, Genomic Health, Inc., Redwood City, CA.

DONALD LOUIS ZUHN, JR., McDonnell Boehnen Hulbert & Berghoff LLP, Chicago, IL, for amicus curiae Paul Gilbert Cole.

TEIGE P. SHEEHAN, Heslin, Rothenberg, Farley & Mesiti, P.C., Albany, NY, for amicus curiae Intellectual Property Owners Association. Also represented by PHILIP STATON JOHNSON, Johnson & Johnson, New Brunswick, NJ; KEVIN H. RHODES, 3M Innovative Properties Company, St. Paul, MN; HERBERT CLARE WAMSLEY, JR., Intellectual Property Owners Association, Washington, DC.

MATTHEW JAMES DOWD, Andrews Kurth LLP, Washington, DC, for amicus curiae JYANT Technologies, Inc. Also represented by ROBERT A. GUTKIN, SUSHILA CHANANA.

JEFFREY LEFSTIN, University of California Hastings College of Law, San Francisco, CA, for amici curiae Jeffrey Lefstin, Peter S. Menell.

JOHN D. MURNANE, Fitzpatrick, Cella, Harper & Scinto, New York, NY, for amicus curiae New York Intellectual Property Law Association. Also represented by ALICIA ALEXANDRA ROSE RUSSO, ERIN AUSTIN; DOROTHY R. AUTH, Cadwalader, Wickersham & Taft LLP, New York, NY; IRENA ROYZMAN, Patterson Belknap Webb & Tyler LLP, New York, NY; DAVID F. RYAN, Croton-on-Hudson, NY.

COREY A. SALSBERG, Novartis International AG, Basel, Switzerland, for amicus curiae Novartis AG.

KEVIN EDWARD NOONAN, McDonnell Boehnen Hulbert & Berghoff LLP, Chicago, IL, for amici curiae Twenty-Three Law Professors.

DAN L. BAGATELL, Perkins Coie LLP, Phoenix, AZ, for amici curiae Wisconsin Alumni Research Foundation, Marshfield Clinic, MCIS, Inc. Also represented by MICHELLE MARIE UMBERGER, Madison, WI; MICHAEL ROBERT OSTERHOFF, Chicago, IL.

Before PROST, *Chief Judge*, NEWMAN, LOURIE, DYK, MOORE, O'MALLEY, REYNA, WALLACH, TARANTO, CHEN, HUGHES, and STOLL, *Circuit Judges*.

LOURIE, *Circuit Judge*, with whom MOORE, *Circuit Judge*, joins, concurs with the denial of the petition for rehearing en banc.

DYK, *Circuit Judge*, concurs with the denial of the petition for rehearing en banc.

NEWMAN, *Circuit Judge*, dissents from the denial of the petition for rehearing en banc.

PER CURIAM.

O R D E R

A petition for rehearing en banc was filed by defendants-appellants Sequenom, Inc. and Sequenom Center for Molecular Medicine, LLC. The petition for rehearing was first referred to the panel that heard the appeal, and thereafter, to the circuit judges who are in regular active service. A response was invited by the court and filed by plaintiffs-appellees Ariosa Diagnostics, Inc. and Natera, Inc. A poll was requested, taken, and failed.

Upon consideration thereof,

IT IS ORDERED THAT:

(1) The petition for rehearing en banc is denied.

(2) The mandate of the court will issue on December 9, 2015.

FOR THE COURT

December 2, 2015
Date

/s/ Daniel E. O'Toole
Daniel E. O'Toole
Clerk of Court

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LOURIE, *Circuit Judge*, with whom MOORE, *Circuit Judge*, joins, concurring in the denial of the petition for rehearing en banc.

I concur in the court's denial of rehearing en banc in this case, based on the precedent of *Mayo Collaborative Services v. Prometheus Laboratories, Inc.*, 566 U.S. __, 132 S. Ct. 1289 (2012). I do so because I find no principled

basis to distinguish this case from *Mayo*, by which we are bound. I write separately to express some thoughts concerning laws of nature and abstract ideas, which seem to be at the heart of patent-eligibility issues in the medical sciences.

Since the Supreme Court's decision in *Bilski v. Kappos*, 561 U.S. __, 130 S. Ct. 3218 (2010), the issue of patent eligibility under § 101 has been of key importance in the adjudication of patent cases, particularly in the field of software. The Court's decisions in *Mayo*, *Association for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. __, 133 S. Ct. 2107 (2013), and *Alice Corp. v. CLS Bank International*, 573 U.S. __, 134 S. Ct. 2347 (2014), have further brought the focus onto the field of medical diagnostics.

The Supreme Court in *Mayo* determined that the claims in that patent "set forth laws of nature." It further held in *Mayo* that steps additional to those setting forth laws of nature in a claimed process must add something "that in terms of patent law's objectives ha[ve] significance" to the natural laws, such that those steps transform the process into an inventive application of those laws. *Mayo*, 132 S. Ct. at 1299. Moreover, the Court rejected "post-solution activity that is purely conventional or obvious" as not significant enough to bring a claimed invention within the realm of patent-eligible subject matter. *Id.* (internal quotation marks and alteration omitted).

Alice relates to the third specific exception to eligibility—abstract ideas—and its discussion also incorporates the requirement of an "inventive concept" beyond "conventional steps." It held that claims that amount to nothing more than *instruction to apply* an abstract idea are not patent eligible, although *application of the abstract idea may be*. In my view, neither of the traditional

preclusions of laws of nature or of abstract ideas ought to prohibit patenting of the subject matter in this case.

Laws of nature are *exact* statements of physical relationships, deduced from scientific observations of natural phenomena. They are often represented by equations, and include such laws as the relationship between energy and mass ($E=mc^2$), the relationship between current and resistance (Ohm's Law), that between force, mass, and acceleration ($F=ma$), Maxwell's equations, Newton's laws of motion, and many more. Those laws, all agree, are not and should not be patent-eligible subject matter. But methods that utilize laws of nature do not set forth or claim laws of nature. All physical steps of human ingenuity utilize natural laws or involve natural phenomena. Thus, those steps cannot be patent-ineligible solely on that basis because, under that reasoning, nothing in the physical universe would be patent-eligible.

Abstract steps are, axiomatically, the opposite of tangible steps; that which is not tangible is abstract. But steps that involve machines, which are tangible, steps that involve transformation of tangible subject matter, or tangible implementations of ideas or abstractions should not be considered to be abstract ideas. In *Bilski*, the Supreme Court supported this proposition when it described our earlier machine-or-transformation test as a useful clue, albeit not the only test, for eligibility.

Conversely, abstract ideas are essentially mental steps; they are not tangible even if they are written down or programmed into a physical machine. *Alice,* in affirming this court, held that claims that amount to nothing significantly more than *instruction to apply* an abstract idea are not patent eligible. But the fact that steps are well-known, although relevant to other statutory sections of the patent law, does not necessarily make them abstract.

The claims at issue in Sequenom's patent are directed to methods for detecting paternally-inherited fetal DNA in maternal blood samples, and performing a prenatal diagnosis based on such DNA. Following *Mayo*, which held that certain steps merely recite natural laws and that the remaining steps must be sufficiently innovative apart from the natural laws, the panel in this case held that the claims do not involve patent-eligible subject matter. Appellants and amici have argued before us in briefs that a broad range of claims of this sort appear to be in serious jeopardy. It is said that the whole category of diagnostic claims is at risk. It is also said that a crisis of patent law and medical innovation may be upon us, and there seems to be some truth in that concern.

The claims in this case perhaps should be in jeopardy, not because they recite natural laws or abstract ideas, but because they may be indefinite or too broad. But they should not be patent-ineligible on the ground that they set forth natural laws or are abstractions.

Claim 1 is directed to a method for detecting a paternally inherited nucleic acid of fetal origin from a pregnant female comprising amplifying a paternally inherited nucleic acid and detecting the presence of a paternally inherited nucleic acid. Claim 21 is directed to a method of performing a prenatal diagnosis comprising providing a maternal blood sample, separating the sample into a cellular and non-cellular fraction, detecting the presence of a nucleic acid, and providing a diagnosis. Both of these claims contain the nucleus of patent-eligible subject matter.

As the panel noted, the natural phenomenon here is the presence of cell-free fetal DNA ("cffDNA") in maternal plasma, which, when subjected to certain conventional steps, has led to an important new development: diagnosis of possible birth defects without using highly intrusive means. Applications of natural phenomena or laws to a

known process "may well be deserving of patent protection." *Diehr*, 450 U.S. at 187. And it is not disputed that this scientific work on its own seems like an important discovery and a valuable contribution to the medical field, although no one asserts that a claim directed to the mere existence of cffDNA is patent-eligible. But neither of the representative claims here merely recites a law of nature, a natural phenomenon, or an abstract idea. The claims rely on or operate by, but do not recite, a natural phenomenon or law. The claimed invention involves taking maternal serum, separating it, amplifying the genetic material to detect cffDNA, and running tests to identify certain genes or genetic defects; these are all physical, and not insignificant, steps requiring human intervention.

The claims might be indefinite or too broad in that they do not specify how to amplify and detect, or how to separate, detect, and diagnose. Or they perhaps attempt to claim all known methods of carrying out those steps. But the finer filter of § 112 might be better suited to treating these as questions of patentability, rather than reviewing them under the less-defined eligibility rules.

It is not disputed that fractionating blood, amplifying DNA, and analyzing DNA to detect specific gene sequences are known techniques in the art. As all other steps in the claims are individually well-known, the innovative aspect of the claims appears to be the improvement in the method of determining fetal genetic characteristics or diagnosing abnormalities of fetal DNA, consisting of *use of the non-cellular fraction of fetal DNA* obtained from a maternal blood sample.

The claim to this invention, then, might have been better drafted as a so-called Jepson claim, which recites what is in the prior art and what is the improvement. Such a claim might read, perhaps with more details added: "In a method of performing a prenatal diagnosis using techniques of fractionation and amplification, the

improvement consisting of using the non-cellular fraction of a maternal blood sample."

Regardless, we are not experts in drafting claims to protect new biological procedures and we are not in a position to rewrite claims or review a hypothetical claim. But against the accusation that such a claim to the invention might be considered mere draftsmanship and thus still ineligible under the seemingly expansive holding of *Mayo*, it must be said that a process, composition of matter, article of manufacture, and machine are different implementations of ideas, and differentiating among them in claim drafting is a laudable professional skill, not necessarily a devious device for avoiding prohibitions. This is true despite the Supreme Court's affirmance of this court in *Alice*, where we had held, by a 7–3 vote, that method and media claims in inventions *of the type claimed there* were essentially the same.

But focusing on the claims we have rather than those we might have had, the claims here are directed to an actual use of the natural material of cffDNA. They recite innovative and practical *uses* for it, particularly for diagnostic testing: blood typing, sex typing, and screening for genetic abnormalities. And it is undisputed that before this invention, the amplification and detection *of cffDNA from maternal blood*, and use of these methods for prenatal diagnoses, were *not* routine and conventional. But applying *Mayo*, we are unfortunately obliged to divorce the additional steps from the asserted natural phenomenon to arrive at a conclusion that they add nothing innovative to the process.

Moreover, the claims here are not abstract. There is nothing abstract about performing actual physical steps on a physical material. And if the concern is preemption of a natural phenomenon, this is, apparently, a novel process and that is what patents are intended to incentivize and be awarded for. The panel here also noted that

there were other uses for cffDNA and other methods of prenatal diagnostic testing using cffDNA that do not involve the steps recited in the various claims. That fact should sufficiently address the concern of improperly tying up future use of natural phenomena and laws.

In sum, it is unsound to have a rule that takes inventions of this nature out of the realm of patent-eligibility on grounds that they only claim a natural phenomenon plus conventional steps, or that they claim abstract concepts. But I agree that the panel did not err in its conclusion that under Supreme Court precedent it had no option other than to affirm the district court.

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DYK, *Circuit Judge*, concurring in the denial of the petition for rehearing en banc.

I concur in the court's denial of rehearing en banc. In my view the framework of *Mayo* and *Alice* is an essential ingredient of a healthy patent system, allowing the inval-

idation of improperly issued and highly anticompetitive patents without the need for protracted and expensive litigation. Yet I share the concerns of some of my colleagues that a too restrictive test for patent eligibility under 35 U.S.C. § 101 with respect to laws of nature (reflected in some of the language in *Mayo*) may discourage development and disclosure of new diagnostic and therapeutic methods in the life sciences, which are often driven by discovery of new natural laws and phenomena. This leads me to think that some further illumination as to the scope of *Mayo* would be beneficial in one limited aspect. At the same time I think that we are bound by the language of *Mayo*, and any further guidance must come from the Supreme Court, not this court.

I

The language of *Mayo* is clear. The *Mayo* Court found that prior Supreme Court decisions "insist that a process that focuses upon the use of a natural law also contain other elements or a combination of elements, sometimes referred to as an 'inventive concept,' sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the natural law itself." *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1294 (2012) (quoting *Parker v. Flook*, 437 U.S. 584, 594 (1978)). Patent claims directed to laws of nature are ineligible under 35 U.S.C. § 101 when, "(*apart* from the natural laws themselves) [they] involve well-understood, routine, conventional activity previously engaged in by researchers in the field." *Id.* (emphasis added). Reviewing the Court's earlier *Flook* decision, the *Mayo* Court determined that Flook's claim to a chemical process applying an "apparently novel mathematical algorithm," *id.* at 1298, was ineligible under § 101 because the steps of the process "were all 'well known,' to the point where, *putting the formula to the side*, there was no 'inventive concept' in the claimed application of the formula," *id.* at

1299 (quoting *Flook*, 437 U.S. at 594) (emphasis added). "[S]imply appending conventional steps, specified at a high level of generality, to laws of nature, natural phenomena, and abstract ideas cannot make those laws, phenomena, and ideas patentable." *Id.* at 1300. In other words, *Mayo* states that the inventive concept necessary for eligibility must come in the application analyzed at step two, rather than from the discovery of the law of nature itself.

Alice subsequently confirmed that the two-step framework articulated in *Mayo* is a unitary rule that applies equally "for distinguishing patents that claim laws of nature, natural phenomena, and abstract ideas from those that claim patent-eligible applications of those concepts." *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347, 2355 (2014) (citing *Mayo*). *Alice* explained,

> First, we determine whether the claims at issue are directed to one of those patent-ineligible concepts. If so, we then ask, what else is there in the claims before us? . . . *We have described step two of this analysis as a search for an inventive concept—i.e.*, an element or combination of elements that is sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the ineligible concept itself.

Id. (emphasis added) (alterations, citations, and quotation marks omitted). "*At Mayo step two*, we must examine the elements of the claim to determine whether it contains an 'inventive concept' sufficient to 'transform' the claimed abstract idea into a patent-eligible application." *Id.* at 2357 (emphasis added) (quotation marks omitted). Thus *Alice* also holds that inventive concept must be found at step two of the framework.

Mayo has unambiguously announced a generally applicable test for determining subject-matter eligibility

under § 101 with respect to laws of nature, and we are bound to follow it. We cannot confine *Mayo* to its facts or otherwise cabin a clear statement from the Supreme Court. "[O]nce the Court has spoken, it is the duty of other courts to respect that understanding of the governing rule of law." *Rivers v. Roadway Express, Inc.*, 511 U.S. 298, 312 (1994). A court of appeals must not "confus[e] the factual contours of [a Supreme Court decision] for its unmistakable holding" to arrive at a "novel interpretation" of that decision. *Thurston Motor Lines, Inc. v. Jordan K. Rand, Ltd.*, 460 U.S. 533, 534–35 (1983) (per curiam). As we have recognized, "[a]s a subordinate federal court, we may not so easily dismiss [the Supreme Court's] statements as dicta but are bound to follow them." *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1347 (Fed. Cir. 2010) (en banc) (citing *Stone Container Corp. v. United States*, 229 F.3d 1345, 1349–50 (Fed. Cir. 2000)).

The panel thus held correctly that *Mayo* is controlling precedent that governs the outcome here. The panel's opinion aptly states and applies the two-step framework of *Mayo*. "First, we determine whether the claims at issue are directed to a patent-ineligible concept." *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371, 1375 (Fed. Cir. 2015) (citing *Mayo*, 566 U.S. at 1292). "[T]he claims at issue, as informed by the specification, are generally directed to detecting the presence of a naturally occurring thing or a natural phenomenon, cffDNA in maternal plasma or serum. . . . [T]he claimed method begins and ends with a naturally occurring phenomenon." *Id.* at 1376. At the second step of the *Mayo* framework, the panel determined that "[t]he method at issue here amounts to a general instruction to doctors to apply routine, conventional techniques when seeking to detect cffDNA." *Id.* at 1377. The panel therefore found that the claims were not patent eligible under § 101. *Id.* at 1378.

II

The *Mayo*/*Alice* framework works well when the abstract idea or law of nature in question is well known and longstanding, as was the situation in *Mayo* itself (as discussed below), earlier Supreme Court cases,[1] and in many of our own recent cases where we have found claims patent ineligible under § 101.[2] Where the abstract idea or

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[1] *See, e.g.*, *Bilski v. Kappos*, 561 U.S. 593, 611 (2010) ("Hedging is a fundamental economic practice *long prevalent* in our system of commerce and taught in any introductory finance class.") (quoting *In re Bilski*, 545 F.3d 943, 1013 (Fed. Cir. 2008) (Rader, J., dissenting)) (emphasis added); *Diamond v. Diehr*, 450 U.S. 175, 177 n.2 (1981) (noting that the Arrhenius equation "*has long been used* to calculate the cure time in rubber-molding processes") (emphasis added); *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 129 (1948) ("Methods of selecting the strong strains [of nitrogen-fixing root-nodule bacteria] and of producing a bacterial culture from them *have long been known*.") (emphasis added); *see also* the influential English patent case discussed in *Mayo*, 132 S. Ct. at 1300, *Neilson v. Harford*, Webster's Patent Cases 295, 371 (1841) ("We think the case must be considered as if the principle [that hot air promotes ignition better than cold air is] *well known* . . . .") (emphasis added).

[2] *See*, *e.g.*, *Intellectual Ventures I LLC v. Capital One Bank*, 792 F.3d 1363, 1369 (Fed. Cir. 2015) (invalidating claims that applied an abstract idea—tailoring of advertising to individual customers—which "had often been" used before); *OIP Techs., Inc. v. Amazon.com, Inc.*, 788 F.3d 1359, 1362, 1364 (Fed. Cir. 2015) (invalidating claims to computerized methods of offer-based price optimization and noting that the abstract idea implicated was a "fundamental economic concept[]"); *Ultramercial,*

law of nature is well known and longstanding, there is no basis for attributing novelty to that aspect of the claimed invention.

Also, it seems to me that the *Mayo*/*Alice* framework works well with respect to abstract ideas. In my view, claims to business methods and other processes that merely organize human activity should not be patent eligible under any circumstances. *See Alice*, 134 S. Ct. at 2360 (Sotomayor, J., concurring); *In re Bilski*, 545 F.3d 943, 972 (Fed. Cir. 2008) (en banc) (Dyk, J., concurring). In any event, departing from the *Mayo*/*Alice* framework with respect to abstract ideas (as opposed to discoveries of natural laws and phenomena) would create serious risks of undue preemption because of the difficulty in distinguishing between new and established abstract ideas.

But, as I see it, there is a problem with *Mayo* insofar as it concludes that inventive concept cannot come from discovering something new in nature—*e.g.*, identification of a previously unknown natural relationship or property. In my view, *Mayo* did not fully take into account the fact that an inventive concept can come not just from creative,

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Inc. v. Hulu, LLC, 772 F3d 709, 715 (Fed. Cir. 2014) (invalidating a claim to routine, conventional application of the abstract idea of "using advertising as an exchange or currency" and rejecting the patentee's argument that the idea was new); *buySAFE, Inc. v. Google, Inc.*, 765 F.3d 1350, 1351, 1355 (Fed. Cir. 2014) (invalidating a claim to a method of guaranteeing a party's performance in an online transaction and finding that the abstract idea implicated was "beyond question of ancient lineage"); *SmartGene, Inc. v. Advanced Biological Labs., SA*, 555 F. App'x 950 (Fed. Cir. 2014) (invalidating a claim to computerized application of a mental process for treating medical patients that "doctors do routinely").

unconventional application of a natural law, but also from the creativity and novelty of the discovery of the law itself. This is especially true in the life sciences, where development of useful new diagnostic and therapeutic methods is driven by investigation of complex biological systems. I worry that method claims that apply newly discovered natural laws and phenomena in somewhat conventional ways are screened out by the *Mayo* test. In this regard I think that *Mayo* may not be entirely consistent with the Supreme Court's decision in *Myriad*.[3]

In *Myriad* the patent applicant discovered a previously unknown natural phenomenon: the sequences of the BRCA1 and BRCA2 genes and their connection with cancer. *Ass'n for Molecular Pathology v. Myriad Genetics, Inc.*, 133 S. Ct. 2107, 2112–13 (2013). While the Court found ineligible Myriad's claims to naturally occurring gDNA sequences, it suggested that "new *applications* of knowledge about the BRCA1 and BRCA2 genes" could generally be eligible, with reference to claim 21 of U.S. Patent No. 5,753,441 (discussed further below).[4] *Id.* at 2120. *Myriad* thus appeared to recognize that an inventive concept can sometimes come from discovery of an

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[3] Any tension between *Mayo* and *Myriad* does not, of course, change our obligation to respect the sweeping precedent of *Mayo*, as the panel did. Supreme Court "decisions remain binding precedent until [the Court] see[s] fit to reconsider them, regardless of whether subsequent cases have raised doubts about their continuing vitality." *Hohn v. United States*, 524 U.S. 236, 252–53 (1998) (citation omitted).

[4] The "new applications" referred to by the Court must have meant applications of the newly discovered genes rather than inventive concepts at step two of the *Mayo*/*Alice* framework.

unknown natural phenomenon, not just from unconventional application of a phenomenon. As *Myriad* emphasized, the first party with knowledge of a law of nature, natural phenomenon, or abstract idea should be "in an excellent position to claim applications of that knowledge." *Id.* (quoting *Ass'n. for Molecular Pathology v. USPTO*, 689 F.3d 1303, 1349 (Fed. Cir. 2012) (Bryson, J., concurring in part and dissenting in part)).

III

Of course, I do not suggest that a newly discovered law of nature should be patent eligible in its entirety. Laws of nature are never patentable as such, even when first discovered by the patent applicant. As *Mayo* recognized, "Einstein could not patent his celebrated law that $E=mc^2$." 132 U.S. at 1293 (quoting *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980)); *see also Flook*, 437 U.S. at 591; *Gottschalk v. Benson*, 409 U.S. 63, 72 (1972) (holding that claims to methods of using a new mathematical algorithm were unpatentable because they "in practical effect would be a patent on the algorithm itself"). *Myriad* itself reminded us that "[g]roundbreaking, innovative, or even brilliant discovery does not by itself satisfy the § 101 inquiry." *Myriad*, 133 S. Ct. at 2117; *see also Ariosa*, 788 F.3d at 1379.

The primary concern with a patent on a law of nature is undue preemption—the fear that others' innovative future applications of the law will be foreclosed. *See O'Reilly v. Morse*, 56 U.S. 62, 113 (1853); *Mayo*, 132 S. Ct. at 1301. As *Mayo* emphasized, "there is a danger that the grant of patents that tie up the[] use [of laws of nature] will inhibit future innovation premised upon them . . . ." 132 S. Ct. at 1301; *see also id.* at 1304 (highlighting "the kind of risk that underlies the law of nature exception, namely the risk that a patent on the law would significantly impede future innovation").

As far back as *O'Reilly v. Morse*, the Supreme Court found unpatentable Morse's sweeping claim to all "marking or printing [of] intelligible characters, signs, or letters, at any distances" via "the use of the motive power of the electric or galvanic current, which I call electro-magnetism," holding that "the claim is too broad, and not warranted by law." 56 U.S. at 112, 113. *Morse*, like *Mayo*, was concerned with undue preemption of the building blocks of human ingenuity. "[W]hile he shuts the door against inventions of other persons, the patentee would be able to avail himself of new discoveries in the properties and powers of electro-magnetism which scientific men might bring to light." *Id.* at 113.

Similarly, in an aspect of our original *Myriad* decision that was not reversed by the Supreme Court, *Ass'n for Molecular Pathology v. Myriad Genetics, Inc.*, 133 S. Ct. 694 (2012), and again in our court's recent *In re BRCA1- & BRCA2-Based Hereditary Cancer Test* decision, we found genetic testing claims that sought to capture "all comparisons between the patient's BRCA genes and the wild-type BRCA genes" to be overbroad and thus ineligible under § 101, noting that "[t]he covered comparisons are not restricted by the purpose of the comparison or the alteration being detected." 774 F.3d 755, 763, 765 (Fed. Cir. 2014).

However, if the breadth of the claim is sufficiently limited to a specific application of the new law of nature discovered by the patent applicant and reduced to practice, I think that the novelty of the discovery should be enough to supply the necessary inventive concept. My proposed approach would require that the claimed application be both narrow in scope and actually reduced to practice, not merely "constructively" reduced to practice by filing of a patent application replete with prophetic examples.

In my view, the breadth of the claim should be critical. Even when a patent applicant has demonstrated some particular utility for a newly discovered law of nature and reduced it to practice, the claim should be invalid unless narrowly tailored to the particular application of the law that has been developed. Claims that extend far beyond the utility demonstrated by the patent applicant and reduced to practice should be invalid, as they "too broadly preempt the use" of the underlying idea by others. *Mayo*, 132 S. Ct. at 1294; *see also Diamond v. Diehr*, 450 U.S. 175, 191–92 (1981). But, so long as a claim is narrowly tailored to what the patent applicant has actually invented and reduced to practice, there is limited risk of undue preemption of the underlying idea. In *Myriad* the Court noted, 133 S. Ct. at 2120, that an example of a meritorious claim might be claim 21 of Myriad's U.S. Patent No. 5,753,441 ("the '441 patent"), which was not at issue in the case and which Judge Bryson discussed in his concurring opinion on our court's decision below, *Ass'n for Molecular Pathology*, 689 F.3d at 1348 (Bryson, J., concurring). Claim 21 of the '441 patent covers a method of detecting any of several specific mutations in the BRCA1 gene, newly discovered by the patent applicant and shown to increase a person's risk of developing particular cancers, using conventional methods. *See In re BRCA1 & BRCA2*, 774 F.3d at 765.

This approach appears also to be supported by *Morse*. The Supreme Court established in *Morse* that the extent to which a patentee can claim is the extent to which he has actually made some concrete use of the discovery and reduced it to practice. "The specification of this patentee describes his invention or discovery, and the manner and process of constructing and using it; and his patent . . . covers nothing more." *Morse*, 56 U.S. at 119. Limiting patentees to narrow applications they have actually developed and reduced to practice would be in

keeping with *Mayo*'s commandment that "simply appending conventional steps, *specified at a high level of generality*, to laws of nature, natural phenomena, and abstract ideas cannot make those laws, phenomena, and ideas patentable." *Mayo*, 132 S. Ct. at 1300 (emphasis added).

This proposed approach, limiting the scope of patents based on new discoveries to narrow claims covering applications actually reduced to practice, would allow the inventor to enjoy an exclusive right to what he himself has invented and put into practice, but not to prevent new applications of the natural law by others.[5] This would ensure that the scope of the patent claims would not "foreclose[] more future invention than the underlying

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[5] It has been suggested that the requirements of enablement and written description will guard against the dangers of overclaiming a law of nature. Those doctrines, important as they are, generally require only that one or a handful of representative embodiments be described by the patentee. *See, e.g.*, Donald S. Chisum, *Chisum on Patents*, § 7.03 at 7-15 (2015) ("An enabling *disclosure* is all that is required [for enablement]. The applicant need not describe actual embodiments or examples. Indeed, an applicant need not have reduced the invention to practice prior to filing."); *Id.* § 7.04[1][e] at 7-309–7-310.1 ("In *Ariad Pharmaceuticals, Inc. v. Eli Lilly & Co.* (2010), the Federal Circuit, sitting en banc, reaffirmed that written description of the invention is a requirement distinct from enablement . . . . [The court] declined to set forth 'bright-line rules,' including rules on the number of species needed to support a generic claim.") (citing and quoting *Ariad*, 598 F.3d at 1351–52). Therefore, the doctrines of enablement and written description would not entirely prevent claims that preempt future applications of the law of nature by others.

discovery could reasonably justify." *Id.* at 1301. Limiting the scope of the patent also would avoid the problem that "the more abstractly [a process patent's] claims are stated, the more difficult it is to determine precisely what they cover." *Mayo*, 132 S. Ct. at 1302 (quoting Christina Bohannan & Herbert Hovenkamp, *Creation without Restraint: Promoting Liberty and Rivalry in Innovation* 112 (2012)).

To be sure, determination of whether a claim applying a new law of nature is overbroad could present difficulties of definition and line drawing. But allowing narrow claims that have been actually reduced to practice when those claims embody an inventive, newly discovered law of nature would promote the fundamental policies underlying § 101. Requiring narrow claims and actual reduction to practice would be a reasonable accommodation in return for a more permissive inventive concept requirement. The approach would, I think, ensure that only diagnostic and therapeutic method patents limited in their claim scope would survive. These patents would provide the world with disclosure and useful applications of previously unknown natural laws, and the opportunity to obtain such patents would help to restore the incentive to make those discoveries that the patent system has historically provided.

IV

To be clear, I do not suggest that *Mayo* was incorrectly decided on its particular facts. The claims at issue in *Mayo* contributed only routine application to a law of nature that was already well known. "At the time the discoveries embodied in the patents were made, scientists *already understood* that the levels in a patient's blood of certain metabolites, including, in particular, [the individual metabolites measured in the claimed methods], were correlated with the likelihood that a particular dosage of a

thiopurine drug could cause harm or prove ineffective." 132 S. Ct. at 1295 (emphasis added). While "those in the field did not know the precise correlations between metabolite levels and likely harm or ineffectiveness," *id.*, "scientists *routinely* measured metabolites as part of their investigations into the relationships between metabolite levels and efficacy and toxicity of thiopurine compounds," *id.* at 1298 (emphasis added). In *Mayo*, the application of the natural law was merely routine optimization of drug dosage to maximize therapeutic effect.[6] As discussed above, *Mayo* thus forms part of a long line of Supreme Court decisions invalidating patent claims to conventional applications of well-known laws of nature.

V

Finally, it seems to me that the approach I suggest would not change the result in this case. Sequenom's challenged claims embody a newly discovered natural phenomenon, the presence of paternally inherited cell-free fetal DNA (cffDNA) in a mother's bloodstream. Judge Linn's concurrence notes that "the amplification and detection of cffDNA had never before been done." *Ariosa*, 788 F.3d at 1381 (Linn, J., concurring). But the major defect is not that the claims lack inventive concept but rather that they are overbroad. *See Mayo*, 132 S. Ct. at 1294.

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[6] *Cf. Pfizer, Inc., v. Apotex, Inc.*, 480 F.3d 1348, 1368 (Fed. Cir. 2007) ("[D]iscovery of an optimum value of a variable in a known process is usually obvious."); *In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997) (noting that generally, in the context of obviousness, "it is not inventive to discover the optimum or workable ranges by routine experimentation") (quoting *In re Aller*, 220 F.2d 454, 456 (CCPA 1955)).

For example, claim 1 of the '540 patent broadly covers any method of detecting paternally inherited cffDNA from maternal serum or plasma via amplification and detection of that cffDNA. '540 patent, col. 23, ll. 61–67. Even the somewhat narrower claim 21 of the '540 patent, which recites a method of performing a prenatal diagnosis based on the presence, quantity, or sequence of paternally inherited cffDNA detected by the method of claim 1, still broadly encompasses *any* diagnosis of *any* disease, disorder, or condition. '540 patent, col. 26, ll. 4–14. Such claims appear to be impermissible attempts to capture the entire natural phenomenon of cffDNA rather than any particular applications thereof developed and actually reduced to practice by the inventors.

A future case is likely to present a patent claim where the inventive concept resides in a newly discovered law of nature or natural phenomenon, but the claim is narrowly drawn and actually reduced to practice. That case will, I hope, provide the Supreme Court with an opportunity to revisit the *Mayo*/*Alice* framework in this one limited aspect.

United States Court of Appeals for the Federal Circuit

ARIOSA DIAGNOSTICS, INC., NATERA, INC.,
Plaintiffs-Appellees

DNA DIAGNOSTICS CENTER, INC.,
Counterclaim Defendant-Appellee

v.

SEQUENOM, INC., SEQUENOM CENTER FOR MOLECULAR MEDICINE, LLC,
Defendants-Appellants

ISIS INNOVATION LIMITED,
Defendant

2014-1139, 2014-1144

Appeals from the United States District Court for the Northern District of California in Nos. 3:11-cv-06391-SI, 3:12-cv-00132-SI, Judge Susan Y. Illston.

NEWMAN, *Circuit Judge*, dissenting from denial of the petition for rehearing en banc.

I agree with my colleagues that this case is wrongly decided. However, I do not share their view that this incorrect decision is required by Supreme Court precedent. The facts of this case diverge significantly from the

facts and rulings in *Mayo Collaborative Services v. Prometheus Laboratories, Inc.*, 132 S. Ct. 1289 (2012), and in *Association for Molecular Pathology v. Myriad Genetics*, 133 S. Ct. 2107 (2013).

In *Mayo,* both the medicinal product and its metabolites were previously known, leaving sparse room for innovative advance in using this information as a diagnostic dosage tool. Nonetheless, the Court recognized the principle that patent eligibility is not disabled when science is put to practical use, stating that "a new way of using an existing drug" is patent-eligible under Section 101. 132 S. Ct. at 1302.

Whether or not *Mayo* drew an appropriate line in that case, particularly in view of the specificity of the diagnostic method that was developed, this decision does not require the drawing of a different line on quite different facts. In the case now before us, the claimed method was not previously known, nor the diagnostic knowledge and benefit implemented by the method.

Similar caveats accompanied the Court's decision in *Association for Molecular Pathology v. Myriad Genetics*, with the Court stating that "this case does not involve patents on new *applications* of knowledge about the BRCA1 and BRCA2 genes." 133 S. Ct. at 2120 (emphasis original). The Court further explained its holding, stating that: "We merely hold that genes and the information they encode are not patent eligible under § 101 simply because they have been isolated from the surrounding genetic material." *Id.*

In the case at bar, the inventors are not claiming the scientific fact of the discovery of paternal DNA in the blood of a pregnant woman; they are claiming the discovery and development of a new diagnostic method of using this information. As the panel recognized, this is a "breakthrough," for this information can now be learned not only earlier in the gestation period than was previous-

ly available, but without the risks of the previously required invasive procedures of penetrating the amniotic sac.

Precedent does not require that all discoveries of natural phenomena or their application in new ways or for new uses are ineligible for patenting; the Court has cautioned against such generalizations. Such caution takes hold for the case at bar. The new diagnostic method here is novel and unforeseen, and is of profound public benefit—"a significant contribution to the medical field," Panel Maj. Op. at 16—a "breakthrough," Panel Conc. Op. at 5. The panel's decision to withhold access to patenting, now endorsed by the en banc court's refusal to rehear the case, is devoid of support.

Nor does patenting of this new diagnostic method preempt further study of this science, nor the development of additional applications. Patenting does, however, facilitate the public benefit of provision of this method through medical diagnostic commerce, rather than remaining a laboratory curiosity.

This subject matter is not ineligible under Section 101, but warrants standard legal analysis for compliance with the requirements of patentability, that is, novelty, unobviousness, specificity of written description, enablement, etc., and whether the claims are appropriately limited, as discussed many years ago in *O'Reilly v. Morse*, 56 U.S. 62, 112 (1853) ("We perceive no well-founded objection to the description which is given of the whole invention and its separate parts, nor to his right to a patent for the first seven inventions set forth in the specification of his claims.").

I respectfully dissent from my colleagues' conclusion that Supreme Court precedent on Section 101 excludes this invention from eligibility for patenting. The subject matter should be reviewed for compliance with Sections

102, 103, and 112, and any other relevant provisions of the patent law.