No. 12-398

IN THE

Supreme Court of the United States

ASSOCIATION FOR MOLECULAR PATHOLOGY, *et al.*,

Petitioners,

v.

MYRIAD GENETICS, INC., *et al.*,

Respondent.

ON PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

AMICI CURIAE BRIEF FOR ACADEMICS IN LAW, MEDICINE, HEALTH POLICY AND CLINICAL GENETICS IN SUPPORT OF PETITIONERS

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INTEREST OF THE *AMICI CURIAE*[1]

Amici Curiae are academics in law, medicine, health policy and clinical genetics. Collectively, they have advised the governments of the United States, Canada, South Africa, the United Kingdom and Australia, as well as international governmental organizations including the Organisation for Economic Co-operation and Development (OECD), the European Union and the World Health Organization on human gene patents and life science innovation. Specifically, they chaired a task force of the Secretary's Advisory Committee on Genetics, Health and Society on human gene patents, testified before Congress on genetic testing, drafted guidelines for the OECD on the licensing of genetic inventions, prepared a report for the OECD on IP management in the life sciences, prepared Opinions for the European Commission on intellectual property issues in life sciences, drafted reports for the U.S. Congress, prepared multiple case studies on gene patenting in the United States and prepared submissions to Australian law reform inquiries into gene patenting.

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1. Counsels of record have each received timely notice of the intent to file this brief under Supreme Court Rule 37. The petitioners have filed a letter of blanket consent to filing *amicus* briefs. The respondents granted consent to *amici* on October 17, 2012 via electronic mail. The *amici* submitting this brief and their counsel hereby represent that no party to this case nor their counsel authored this brief in whole or in part, and that no person other than *amici*, using research funds provided by VALGEN, paid for or made a monetary contribution toward the preparation and submission of this brief.

has authored an extensive case study of Myriad Genetics and its patenting policies and was the Expert Consultant who drafted the OECD Guidelines on the Licensing of Genetic Inventions. He practiced law in the areas of intellectual property licensing and financing of small to medium technology companies and has provided judicial education in the United States, Canada and France on questions of intellectual property, property and the life sciences. He also heads intellectual property and technology transfer research within the Value Addition through Genomics and GE3LS (VALGEN), a publicly financed research project on agriculture and crop biotechnology.

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President of the European Group on Ethics in Science and New Technologies (EGE) that advises the European Commission, Council and Parliament on Ethical issues. He has written extensively on patent issues in relation to the life sciences for the European Commission and has served on several UK advisory bodies in relation to the use of genetically modified organisms.

SUMMARY OF ARGUMENT

Certiorari is required to redress the Federal Circuit's disregard for this Court's decisions, most notably that of *Mayo v. Prometheus*, 132 S.Ct. 1289 (2012). This Court's intervention is further necessitated by the uncertainty that the Federal Circuit introduced over patent eligibility not only in the field of human clinical genetics but in the life sciences generally. Finally, this case offers the Court with the opportunity to further develop its holding in *Mayo* concerning the independent and important function of the 35 U.S.C. § 101 in determining patentable subject matter.

By refusing to modify its vacated decision in any significant manner following this Court's remand in the present case, the Federal Circuit disregarded the Court's admonition that patent law not inhibit "more future invention than the underlying discovery could reasonably justify." (*Mayo* at 1301). This Court in *Mayo* provided a strong rationale for § 101 having an important role independent of §§ 102, 103, and 112, a rationale largely ignored by the Federal Circuit's majority and concurring opinions.

Beyond its legal errors, the Federal Circuit introduced confusion into the determination of patent eligibility under

§ 101 in at least three respects: (1) it introduced a bright-line test of covalent bond-breaking for patent eligibility of naturally occurring biological molecules; (2) it set out two conflicting tests of the meaning of "markedly different" under this Court's holding in *Chakrabarty*; and (3) it assessed the claims at issue from the point of view of a chemist when the patent applicant had specifically set out the field of art as being genetics.

Because the effects of this decision will be felt in many areas of the life sciences in which natural molecules are involved, it is critical that this Court provide guidance in line with its decisions in *Mayo* and *Bilski* on the application of § 101 to DNA molecules, in particular, and compositions of matter in general.

ARGUMENT

Certiorari is required in this case to correct the introduction by the Federal Circuit of a bright-line, yet scientifically incoherent, test for patentability under 35 U.S.C. § 101 that contradicts the principles laid down by this Court in *Mayo v. Prometheus*, 132 S.Ct. 1289 (2012). The Federal Circuit's test not only ignores the fundamental balance sought to be achieved through patent law, but introduces such new uncertainty into the determination of which natural molecules can be patented as to pose a serious risk to investments not only in clinical genetics, but in the life sciences more generally. This appeal provides the Court with an opportunity to assess, for the first time, claims covering naturally occurring molecules that have not been altered in such a manner as to change their biological function or utility.

I. THE DECISION OF THE FEDERAL CIRCUIT CONFLICTS WITH DECISIONS OF THIS COURT WITH RESPECT TO THE SCOPE OF § 101

This Court, in *Mayo*, provided a clear understanding of the independent role played by the exception to patentable subject matter implicit in § 101 relating to laws of nature, natural phenomena, and abstract ideas. This understanding has four elements.

A. The Four Elements of the *Mayo* Test for Patent Eligibility

First, § 101 implicitly contains *one* overarching exception with three sub-components—laws of nature, natural phenomena and abstract ideas—and not three distinct exceptions. ("The Court has long held that this provision contains *an important* implicit exception. '[L]aws of nature, natural phenomena, and abstract ideas' are not patentable." (*Mayo* at 1293, citations omitted, emphasis added.) The three sub-components are simply convenient ways to address different aspects of one central, principled exception rather than constituting three, narrow, water-tight and independent exceptions. This is illustrated in *Mayo* by the Court's reliance on cases falling into each of the three sub-components (*O'Reilly v. Morse*, 15 How. 62 (1854) with respect to laws of nature; *Funk Brothers Seed Col v. Kalo Inoculant Col*, 333 U.S 127 (1948) and *Diamond v. Chakrabarty*, 447 U.S. 303 (1980) regarding natural phenomena; *Diamond v. Diehr*, 447 U.S. 303 (1981), *Parker v. Flook*, 437 U.S. 584 (1978), and *Bilski v. Kappos*, 130 S. Ct. 3218 (2010) each dealing with abstract ideas) to elucidate the central purpose underlying the exception. In fact, the *Mayo* Court held

that two cases, *Diehr* and *Flook*, both of which relate to *abstract ideas*, were "most directly on point" in relation to the *law of nature* at issue in *Mayo*. (*Mayo* at 1298.)

Second, that underlying purpose behind the exception is to avoid the "danger that the grant of patents that tie up [the] use [of laws and principles] will inhibit future innovation premised upon them, a danger that becomes acute when a patented process amounts to no more than an instruction to 'apply the natural law,' or otherwise forecloses more future invention than the underlying discovery could reasonably justify." (*Mayo* at 1301, citations omitted.) The Court recognized that patent law must consider both the facilitative and inhibitory effects of patents so as to maximize innovation:

> Patent protection is, after all, a two-edged sword. On the one hand, the promise of exclusive rights provides monetary incentives that lead to creation, invention, and discovery. On the other hand, that very exclusivity can impede the flow of information that might permit, indeed spur, invention, by, for example, raising the price of using the patented ideas once created, requiring potential users to conduct costly and time-consuming searches of existing patents and pending patent applications, and requiring the negotiation of complex licensing arrangements. (*Mayo* at 1305).

Third, the exception flows from the policy inherent in the patent laws as passed by Congress, not from definitions and concepts deriving from particular branches of science ("[P]atent law's general rules must govern inventive

activity in many different fields of human endeavor, with the result that the practical effects of rules that reflect a general effort to balance these considerations may differ from one field to another." *Mayo* at 1305.) Further, the Court acknowledged that, in applying the exception, the courts should not engage in evaluating the scientific subtleties of a field of technology, an evaluation that the courts are ill-equipped to investigate: "Courts and judges are not institutionally well suited to making the kinds of judgments needed to distinguish among different laws of nature. And so the cases have endorsed a bright-line prohibition against patenting laws of nature, mathematical formulas and the like, which serves as a somewhat more easily administered proxy for the underlying "building-block" concern." (*Mayo* at 1303.)

Fourth, the exception plays its role independently from any subsequent, substantive, investigations into novelty, non-obviousness or description. ("These considerations lead us to decline the Government's invitation to substitute §§ 102, 103, and 112 inquiries for the better established inquiry under § 101." *Mayo* at 1304.) "[T]o shift the patent-eligibility inquiry entirely to these later sections risks creating significantly greater legal uncertainty, while assuming that those sections can do work that they are not equipped to do." (*Mayo* at 1304.)

B. The Federal Circuit Ignored and Contradicted this Court's Test in *Mayo*

The majority in the Federal Circuit ignored each and every one of these holdings.

First, the Federal Circuit held that there are three separate and narrow exceptions, rather than one

principled exception to patent eligibility: "The Court's precedents provide three judicially created exceptions to § 101's broad patent-eligibility principles." (App. at 42a) This leads the Federal Circuit to erroneously conclude that *Mayo*, which dealt with laws of nature, had no application to the composition-of-matter claims before the court. ("Mayo does not control the question of patent-eligibility of such claims." App. at 44a.) Instead, the Federal Circuit restricted its analysis to only two cases, *Chakrabarty* and *Funk Brothers*, thus failing to acknowledge the fundamental and common link between the exception to patent eligibility in all its forms. ("While *Mayo* and earlier decisions concerning method claim patentability provide valuable insights and illuminate broad, foundational principles, the Supreme Court's decisions in *Chakrabarty* and *Funk Brothers* set out the primary framework for deciding the patent eligibility of compositions of matter, including isolated DNA molecules." App. at 48a, citation omitted.)

Second and due to this error, the Federal Circuit not only ignored this Court's discussion of the underlying purpose of the exception in *Mayo* but flatly contradicted it. The Federal Circuit held the negative effects on further innovation and use of innovation caused by patents was not before them: "The question is also not whether is it desirable for one company to hold a patent or license covering a test that may save people's lives, or for other companies to be excluded from the market encompassed by such a patent—that is the basic right provided by a patent, i.e., to exclude others from practicing the patented subject matter." This opposes the clear statement in *Mayo* that this is, in essence, the primary motivation of the exception to patent eligibility in § 101. Because of this error, the Federal Circuit ignored the fact that the use of DNA in

the disputed claims depended directly and uniquely on its informational function. ("The claimed isolated DNA molecules are distinct from their natural existence as portions of larger entities, and their informational content is irrelevant to that fact." App. at 55a.)

Third, rather than engaging in a discussion of balancing the positive and negative effects of patents on innovation, the Federal Circuit attempted to answer the question of patent eligibility based on a technical analysis of the phenomenon of nature at issue–DNA–despite this Court's admonition in *Mayo* that the judiciary is institutionally ill-equipped to engage in this analysis. Proving this Court's admonition, the Federal Circuit answered the question of patent eligibility based on a faulty scientific understanding of DNA. Among the clear scientific errors that the Federal Circuit made were the following:

- A privileging of *covalent* over other forms of chemical bonds when the function of DNA relies on *hydrogen* bonds; and

- Asserting that DNA molecules that are covalently separated from chromosomes (thus "isolated") are not found in nature, whereas DNA molecules not covalently bound to chromosomal DNA are commonly found within cells in the process of normal cell division and DNA repair.

The consequence of these scientific errors is a decision of the Federal Circuit that cannot be supported by either law or science.

Fourth, the Federal Circuit ignored this Court's holding in *Mayo* that the analysis under § 101 is logically and structurally independent from that under §§ 102, 103, and 112. For example, the Federal Circuit refused to examine the uses of DNA, which are very relevant to the question of the impact of the patent claims on future innovation, on the basis that such analysis should be exclusively undertaken under § 103: "Uses of chemical substances may be relevant to the nonobviousness of these substances or to method claims embodying those uses, but the patent eligibility of an isolated DNA is not negated because it has similar informational properties to a different, more complex natural material." (App. at 55a). The lack of understanding of the uses of DNA led the Court to narrowly assess the patent eligibility of DNA on the basis of its being a chemical and ignoring its critical biological functions and how those functions have an impact on innovation: "We recognize that biologists may think of molecules in terms of their uses, but genes are in fact materials having a chemical nature and, as such, are best described in patents by their structures rather than by their functions." (App. at 55a).

Collectively, these errors undermine this Court's holding in *Mayo* and threaten to eviscerate the importance of the § 101 exception to patent eligibility developed by the Court since the mid-1800s.

II. THE DECISION OF THE FEDERAL CIRCUIT INTRODUCES CONFUSION INTO AN IMPORTANT AREA OF FEDERAL LAW

The Federal Circuit introduced significant uncertainty into determinations of the patent eligibility of biological

molecules under 35 U.S.C. § 101 of the Patent Act. As naturally occurring biological molecules are ubiquitous not only in clinical genetics but in the life sciences generally—including medicine, agriculture, aquaculture, tree biotechnology, industrial biotechnology and new forms of energy—the majority's decision sows confusion in a critical area of federal law with effects across many industries throughout the United States.

In particular, the majority in the Federal Circuit creates the following three forms of uncertainty:

1. It asserts an arbitrary and scientifically illegitimate defining boundary between the claimed invention and nature: the cleavage of a covalent bond (App. at 54a ("But a covalent bond is the defining boundary between one molecule and another").) There is nothing unique regarding the importance of covalent bonds in chemistry or biology. Indeed, other types of bonds—such as the hydrogen bonds linking base pairs on opposing DNA strands that are critical for both replication and transcription and the ionic bonds that link histones to the DNA backbone that are essential to transcription—are at least as important. Hydrogen bonds between purines and pyrimidines, in particular, are features of DNA structure that are taught in textbooks as essential to its biological function;

2. It sets out conflicting criteria to determine whether a claimed invention is "markedly different," as required by *Chakrabarty*, from its natural counterpart so as to constitute eligible

subject-matter under § 101. The majority opinion of Judge Lourie took the position that a structural difference between the claimed matter and natural product was sufficient to be "markedly different" whereas both the concurring opinion of Judge Moore and the dissent of Judge Bryson stated that the claimed matter must be both structurally and functionally different from a natural product to so qualify; and

3. It assesses patent eligibility of claims from the point of view of a person having ordinary skill in the art (PHOSITA) of chemistry rather than of genetics, despite the clear application of the claimed invention in the life sciences and the specific statement of the patent applicant.

A. Cleavage of a Covalent Bond as Test for Patent Eligibility Introduces Uncertainty

The majority of the Federal Circuit held that the claimed isolated DNA molecules were chemically distinct from DNA in the human body (App. at 53a) because Myriad had cleaved "a covalent bond [which] is the defining boundary between one molecule and another." (App. at 54a.) This argument introduces a test of patent eligibility under § 101—the breaking of covalent bonds— that is inappropriate and sows confusion in determining which naturally occurring biological molecules, in fields well beyond clinical human genetics, are eligible to be patented.

The Federal Circuit failed to provide a reason that covalent, rather than other types of bonds—in particular ionic and hydrogen bonds—are the features

that distinguish what is patentable from that which is not patentable. The majority's only explanation is based on a fundamental misunderstanding of a seminal 1960s text on chemistry: "But a covalent bond is the defining boundary between one molecule and another, and the dissent's citation of Linus Pauling's comment that covalent bonds 'make it convenient for the chemist to consider [the aggregate] as an independent molecular species' underlines the point." (App. at 54a.)

The majority's misreading of Pauling actually proves the point opposite to that it was making. Pauling was talking of chemical bonds in general—which also include ionic and hydrogen bonds—rather than only covalent bonds. The actual quote from Pauling is "that there is a chemical bond between two atoms or groups of atoms in case that the forces acting between them are such as to lead to the formation of an aggregate with sufficient stability to make it convenient for the chemist to consider it as an independent molecular species." LINUS PAULING, THE NATURE OF THE CHEMICAL BOND AND THE STRUCTURE OF MOLECULES AND CRYSTALS: AN INTRODUCTION TO MODERN STRUCTURAL CHEMISTRY 6 (3d ed. 1960). Pauling defined chemical bond on the previous page as including "electrostatic bonds [which include both ionic and hydrogen bonds], covalent bonds and metallic bonds." *Id*. at 5.

Indeed, hydrogen bonds, and not covalent bonds, are the most important defining characteristic of DNA as they are responsible for the unique complementary structure of the double helix and for the manner in which the DNA is folded. In fact, one of the key discoveries to how DNA is copied in cells came from the discovery of naturally

occurring DNA fragments that are not covalently bound to the DNA backbone but that are newly synthesized and held in place by hydrogen bonds. This natural synthesis occurs in the same way that, using the CAFC's definition of 'isolated', isolated DNA molecules are produced when using current DNA diagnostic methods. While covalent bonds certainly play an important role in biology, and provide DNA chemical stability as the repository of genetic information, other bonds are of greater significance in the field of genetics. The essence of DNA, its information-carrying capacity and its ability to replicate, is directly dependent upon hydrogen bonds that link the base pairs in opposing strands. It is an anti-symmetrical double helix precisely and only because of hydrogen bonds, not the covalent bonds in the backbone. Similarly, the ability of DNA to copy itself (replication) and the transcription of DNA into RNA rely on both hydrogen bonds and the ionic bonds connecting histones and DNA-binding proteins that turn on and off transcription.

Even the concurring opinion expressed doubt as to whether the cleavage of covalent bonds was sufficient to establish the patent eligibility of isolated DNA sequences: "If I were deciding this case on a blank canvas, I might conclude that an isolated DNA sequence that includes most or all of a gene is not patentable subject matter." (App. at 86a.)

The problem with the majority's decision is far deeper, however, than the arbitrariness with which it privileged the role of covalent bonds over other types of bond: the majority failed to provide a substantive rationale of why the cleavage of any bond should be the key to determining patent eligibility under § 101. It cited no cases to support

this decision and failed to consider the effect of its novel test on the patentability of other naturally occurring biological molecules, such as proteins, and other naturally occurring structures, such as cell lines. Claims reading over isolated proteins would seemingly fail the majority's test, as no covalent bond would normally be cleaved during this process of isolation. This would have a profound effect not only in the limited area of human clinical genetics, but across all of biology from regenerative medicine (e.g., U.S. Patent No. 8,057,788 (filed Dec. 28, 2006), directed to placental stem cells, assigned to the Anthrogenesis Corporation of New Jersey); to agriculture (e.g., U.S. Patent No. 8,067,669 (filed Mar. 5, 2010), directed to a protein to inhibit soya rust, assigned to The University of Missouri); industrial applications (e.g., U.S. Patent No. 8,034,600 (filed Aug. 5, 2008), directed to a protein used in starch and alcohol production, cleansing and textiles, assigned to Danisco U.S. of California); and energy (e.g., U.S. Patent No. 8,004,264 (filed Sept. 23, 2008), directed to proteins that enhance the use of wood, agricultural crops and other organic materials into ethanol, assigned to Novozymes, Inc. of California).

None of this Court's decisions call for the bright-line test developed by the majority in the Federal Circuit. On the contrary, this Court has repeatedly warned against the use of arbitrary tests in the application of § 101 (see e.g., *Bilski*). The majority's decision violates this rule, introducing a test for patent eligibility that is not only unsupported by legislation, case law or scientific principle, but that creates significant uncertainty over the patent eligibility of a large range of naturally occurring biological molecules.

B. Conflicting Tests for Patentable Subject Matter under § 101

While the majority opinion found isolated DNA sequences to constitute patentable subject matter under § 101, the two members of the majority disagreed on the legal rule to be used in arriving at this decision, sowing further confusion for the application of this rule in the future.

Judge Lourie, in the majority decision, interpreted this Court's decision in *Chakrabarty* as drawing "a line between compositions that, even if arrayed in useful combinations or harnessed to exploit newly discovered properties, have similar characteristics as in nature, and compositions that human intervention has given 'markedly different,' or 'distinctive,' characteristics." (App. at 50a.) He then gave an interpretation of "markedly different" and "distinctive" that reduced the meaning of these terms to require a structural difference, even if not directly relevant to what renders the invention inventive: "We disagree, as it is the distinctive nature of DNA molecules as isolated compositions of matter that determines their patent eligibility rather than their physiological use or benefit." (App. at 55a.)

Both the concurring opinion and the dissent interpreted *Chakrabarty* more in line with its literal meaning, as requiring more than a mere structural difference between the claimed invention and naturally occurring DNA sequences. The concurring opinion noted that: "To the extent the majority rests its conclusion on the chemical differences between genomic and isolated DNA (breaking the covalent bonds), I cannot agree that this is sufficient

to hold that the claims to human genes are directed to patentable subject matter." (App. at 81a-82a). Similarly, the dissent found that a claimed invention must exhibit both structural and functional differences from natural compositions of matter: "In sum, the test employed by the Supreme Court in *Chakrabarty* requires us to focus on two things: (1) the similarity in structure between what is claimed and what is found in nature and (2) the similarity in utility between what is claimed and what is found in nature." (App. at 110a.)

The result of these different opinions is that, while the majority opinion of the Federal Circuit held that structural differences between a naturally occurring biological compound and a claimed invention were sufficient to meet the requirements of § 101, a majority of judges found that a functional difference was also required. This mixed reasoning within the Federal Circuit establishes an incoherent and inconsistent set of rules for future courts attempting to apply § 101.

C. The Federal Circuit Relies on the Wrong PHOSITA

In *Ultramercial, LLC v. Hulu, LLC*, 657 F.3d 1323 (Fed. Cir. 2011), the Federal Circuit recognized the importance of providing context for a claim prior to an analysis of its patent eligibility under § 101. "On many occasions, however, a definition of the invention via claim construction can clarify the basic character of the subject matter of the invention. Thus, claim meaning may clarify the actual subject matter at stake in the invention and can enlighten, or even answer, questions about subject matter abstractness." Id. at 1325.

While the court in *Ultramercial* did not explicitly address whether claim construction for purposes of patent eligibility under § 101 follows the general rules of claim construction for patent infringement, its clear implication was that it did. Nevertheless, the majority in the Federal Circuit in the case under appeal chose not the PHOSITA in the field specifically noted by the patent applicant, nor a scientist in the life sciences (a geneticist or biochemist), but a chemist who would not be specifically knowledgeable about the invention, its utility or its import. In so doing, the majority created confusion in the construction of life science claims.

In the case under appeal, the Federal Circuit began the process of claim construction by situating the claims in light of the understanding that a chemist would bring to the claimed invention. "We recognize that biologists may think of molecules in terms of their uses, but genes are in fact materials having a chemical nature and, as such, are best described in patents by their structures rather than their functions." (App. at 55a.) Based on the understanding of a chemist, the majority held that: "Although isolated DNA is removed from its native cellular and chromosomal environment, it has also been manipulated chemically so as to produce a molecule that is markedly different from that which exists in the body." (App. at 52a.)

While the majority was correct in placing the claim within the context of a specific art to which it applies, it selected the wrong PHOSITA. As noted by the dissent: "If we are to apply the conventional nomenclature of any field to determine whether Myriad's isolated DNA claims are 'new,' it would seem to make more sense to look to genetics, which provides the language of the claims, than to chemistry." (App. At 105a.)

Further, the patent documents prepared by Myriad point directly to the field of genetics rather than to chemistry. In fact, the opening line in several sections, including the abstract and description, of U.S. Patent No. 5,747,282 (filed June 7, 1995) states: "The present invention relates generally to the field of human genetics."

The majority's error in selecting a PHOSITA permeates its decision. In particular, it leads the majority to the biologically incorrect conclusion that:

> It is undisputed that Myriad's claimed isolated DNAs exist in a distinctive chemical form—as distinctive chemical molecules—from DNAs in the human body, i.e., native DNA. Natural DNA exists in the body as one of forty-six large, contiguous DNA molecules. Each of those DNA molecules is condensed and intertwined with various proteins, including histones, to form a complex tertiary structure known as chromatin that makes up a larger structural complex, a chromosome. Inside living cells, the chromosomes are further encapsulated within a series of membranes and suspended in a complex intracellular milieu.
>
> Isolated DNA, in contrast, is a free-standing portion of a larger, natural DNA molecule. Isolated DNA has been cleaved (i.e., had covalent bonds in its backbone chemically severed) or synthesized to consist of just a fraction of a naturally occurring DNA molecule. For example, the BRCA1 gene in its native state resides on chromosome 17, a DNA

> molecule of around eighty million nucleotides. Similarly, BRCA2 in its native state is located on chromosome 13, a DNA of approximately 114 million nucleotides. (App. at 51a) (citations and cross-references omitted.)

The above conclusion ignores biological reality by assuming that native DNA exists *solely* in the form of large, contiguous chromosomes and that smaller strands of DNA are not natural. In fact, DNA naturally exists (for example during replication) within organisms in varying lengths that are much smaller than an entire chromosome, as assumed by the majority. DNA molecules smaller than an entire chromosome but corresponding to claimed DNA sequences (e.g., claims 5 and 6 of '282) commonly exist in nature. Such molecules are regularly created within cells during DNA replication and through normal mistakes in DNA transcription or through the cleavage of a covalent bond within the chromosome caused by radiation or a natural chemical agent. In fact, ironically, BRCA1 and BRCA2 proteins apparently play a role in repairing just such cleavages. See Serena L. Clark, Ana M. Rodriguez, Russel R. Snyder, Gary D.V. Hankins & Darren Boehning, *Structure-Function of the Tumor Suppressor BRCA1,* 1(1) Computational and Structural Biotechnology Journal e201204005 and Ashok R. Venkitaramen, Cancer Susceptibility and the Functions of BRCA1 and BRCA2, 108(2) CELL 171 (2002). That is, BRCA1/2 protein function is needed in cells precisely because sub-chromosomal DNA molecules with cleaved covalent bonds occur naturally.

Given the differences between a chemist and a geneticist in appreciating the biochemistry of the cell,

the majority decision introduces significant confusion in determinations of patent eligibility under § 101.

CONCLUSION

Because of the uncertainty that the Federal Court injected into a critical area of federal law that extends across all of the life sciences as well as the conflict between the decision of the Federal Circuit and those of this Court, the petition for certiorari should be granted.

Respectfully submitted,

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