NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK,
Appellant

v.

ILLUMINA, INC.,
Appellee

2014-1547

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2012-00006.

TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK,
Appellant

v.

ILLUMINA, INC.,
Appellee

2014-1548

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2012-00007.

TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK,
Appellant

v.

ILLUMINA, INC.,
Appellee

2014-1550

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2013-00011.

Decided: July 17, 2015

PAUL REINHERZ WOLFSON, Wilmer Cutler Pickering Hale and Dorr LLP, Washington, DC, argued for appellant. Also represented by MATTHEW GUARNIERI; DONALD J. CURRY, ROBERT SETH SCHWARTZ, ANTHONY M. ZUPCIC, Fitzpatrick, Cella, Harper & Scinto, New York, NY; JOHN P. WHITE, Cooper & Dunham, LLP, New York, NY.

EDWARD R. REINES, Weil, Gotshal & Manges LLP, Redwood Shores, CA, argued for appellee. Also represented by DEREK C. WALTER, MICHELE GAUGER, MARION MCLANE READ, Redwood Shores, CA; AUDREY LYNN MANESS, Houston, TX.

Before PROST, *Chief Judge*, SCHALL and WALLACH, *Circuit Judges*.

WALLACH, *Circuit Judge*.

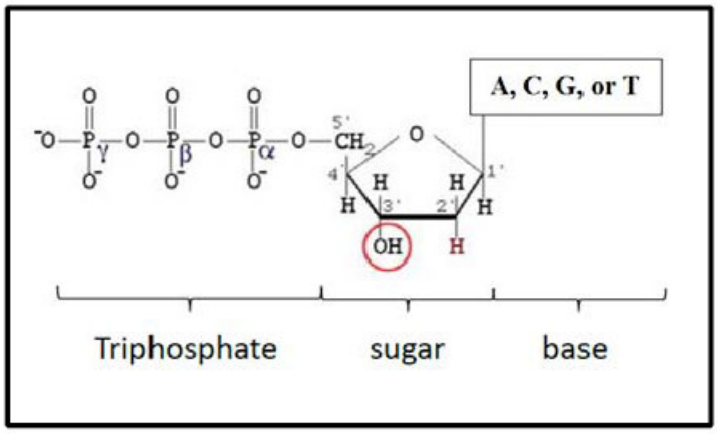
This opinion addresses companion appeals from the inter partes reviews of three patents before the Patent Trial and Appeal Board ("PTAB") of the United States Patent and Trademark Office, with Illumina, Inc. ("Illumina"), as petitioner and the Trustees of Columbia University in the City of New York ("Columbia University") as patent owner. The patents are generally directed to sequencing (i.e., determining the nucleotide sequence of) deoxyribonucleic acid ("DNA"), and include U.S. Patent Nos. 7,713,698 (the "'698 patent") (Appeal No. 2014-1547), 8,088,575 (the "'575 patent") (Appeal No. 2014-1548), and 7,790,869 (the "'869 patent") (Appeal No. 2014-1550). The PTAB found all challenged claims anticipated or obvious over the prior art. For the reasons set forth below, this court affirms.

BACKGROUND

I. The Science of DNA as It Relates to These Appeals

DNA is a double-stranded molecule that encodes the genetic information of living organisms. Each strand consists of a series of chemical structures called nucleotides, the particular order of which determines the heritable characteristics of living organisms. DNA sequencing is useful in a variety of fields, especially medicine, where it can help researchers uncover the genetic bases of diseases and in turn design targeted therapies.

Each nucleotide within the DNA molecule consists of three distinct parts, including a sugar, a base, and one or more phosphate groups:



Appellant's Br. 4.[1]

Four bases exist in naturally-occurring DNA, including adenine ("A"), guanine ("G"), cytosine ("C"), or thymine ("T"). A and G are known as "purines," while C and T are known as "pyrimidines." The sugar component of each nucleotide is comprised of five carbon atoms, conventionally numbered 1' ("one prime") through 5' ("five prime") and represented by the vertices of the pentagonal sugar structure, as illustrated. Nucleotides not incorporated into a DNA strand contain a hydroxyl group (oxygen bonded to hydrogen, or "OH") at the 3' position ("3'-OH group"). When nucleotides join together to form DNA, a single oxygen atom ("O") links the phosphate group with the sugar at the 3'-OH position:

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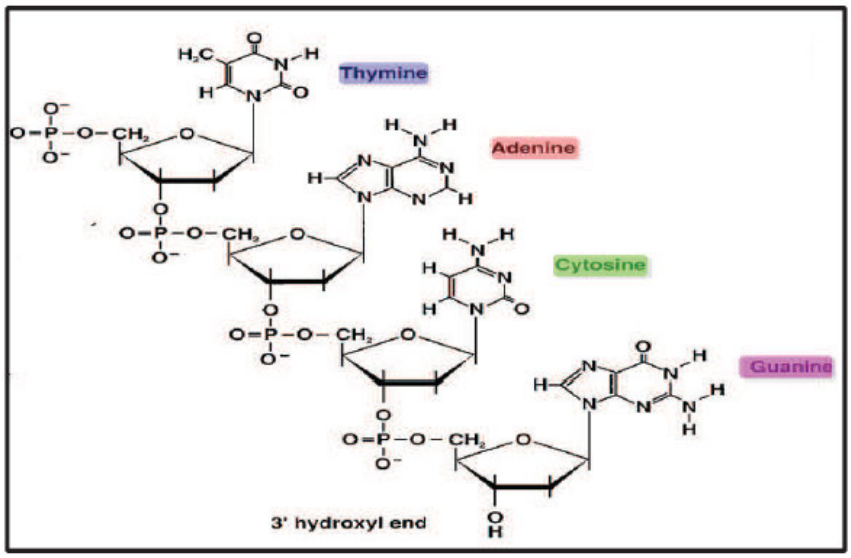
[1] All references to the briefs and Joint Appendix ("J.A.") are to Appeal No. 2014-1547 unless otherwise indicated.



Appellant's Br. 4.

In living organisms, DNA exists as a double-stranded helical structure held together by hydrogen bonds between "complementary" base pairs. A and T are complementary, and thus pair with each other, and G and C are complementary, and thus pair with each other. During DNA replication (such as during sequencing), the two strands are separated and a short chain of nucleotides known as a "primer" binds to a portion of the single-stranded DNA where copying will begin. Polymerase, an enzyme, causes the primer to be extended in a manner complementary to the chain being copied (i.e., matching A to T, and G to C). Important to the present matter, the phosphate group of each new nucleotide added to the lengthening DNA strand bonds to the 3'-OH group of the last nucleotide already in the strand.

In the 1970s, British biochemist Frederick Sanger and Alan Coulson invented a sequencing method that relies on modified nucleotides called dideoxynucleotides ("ddNTPs"), which have a hydrogen atom ("H") rather

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