



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/822,231	06/03/2013	Anders Ohrn	069480-5007-US	4953
43850	7590	11/22/2017	EXAMINER	
MORGAN, LEWIS & BOCKIUS LLP (SF) One Market, Spear Street Tower, Suite 2800 San Francisco, CA 94105			BORIN, MICHAEL L	
			ART UNIT	PAPER NUMBER
			1631	
			NOTIFICATION DATE	DELIVERY MODE
			11/22/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

sfipdocketing@morganlewis.com
donald.mixon@morganlewis.com

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ANDERS OHRN and GREGORY LAKATOS¹

Appeal 2017-003914
Application 13/822,231
Technology Center 1600

Before JOHN G. NEW, RICHARD J. SMITH, and
DEVON ZASTROW NEWMAN, *Administrative Patent Judges*.

NEW, *Administrative Patent Judge*.

DECISION ON APPEAL

¹Appellants state that the real party-in-interest is Perceptive Credit Opportunities Fund, L.P. App. Br. 3.

SUMMARY

Appellants file this appeal under 35 U.S.C. § 134(a) from the Examiner's Final Rejection of claims 1, 5, 6, 9, 13, 14, 19, 20, 24, and 29–33 as unpatentable under 35 U.S.C. § 101 as being directed to nonstatutory subject matter.

We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

NATURE OF THE CLAIMED INVENTION

Appellants' invention is directed to a method of determining changes in a first set of residues, r_1 , due to changes in a second set of residues, r_2 , in a protein system by optimizing a quality function, Q , by modifying one or more properties of r_1 and r_2 in a constrained environment, in which all degrees of freedom of the system except those directly involved in the potential coupling between r_1 and r_2 are removed. Abstract.

REPRESENTATIVE CLAIM

Claim 1 is representative of the claims on appeal and recites:

1. A computer implemented method of determining changes in a property value of a first set of residues r_1 due to perturbations² in a second set of residues r_2 in a protein system

²² Appellants' Specification defines "perturbation" as:

A perturbation can be any change to any property of a residue. For example, a perturbation can be a change in structure (e.g., a change in one or more dihedral angles, bond angles or bond lengths, in any combination), amino acid type (i.e., a mutation),

comprising one or more proteins, the protein system comprising r_1 and r_2 , the method comprising:

for each respective perturbation p_i in a first set of perturbations $P_1 = \{p_1, \dots, p_n\}$, wherein n is a user-defined number of perturbations of value 2 or greater, performing the method of:

(a) applying the respective perturbation p_i to r_2 , wherein the respective perturbation is an alteration to the structure of one or more residues of r_2 ;

(b) optimizing, responsive to the applying (a) and using an atomistic force field for the entire protein system, a quality function Q by modifying the conformation of residues of r_1 and r_2 in a constrained environment in which the backbone of all residues in the protein system apart from the residues in r_2 and r_1 are fixed during the optimization and in which C_β atoms of all residues, other than glycine residues and proline residues, in the protein system apart from the residues in r_2 and r_1 are fixed during the optimization and, wherein the quality function Q comprises a free energy term for r_1 and r_2 ; and

(c) applying, upon completion of the optimizing (b), a measure M to r_1 thereby providing a physical property value v_i of r_1 , wherein the physical property value is a side-chain conformation value, a backbone conformation value, or a rotamer conformation value, and wherein the measure M comprises an enumeration of the residues in r_1 that exhibit an altered property after application of one or more perturbations to the residues of r_2 and optimization of Q , thereby obtaining a first set of property values $V_1 = \{v_1, \dots, v_n\}$ for r_1 , and thereby

the model used to represent a residue or the model used to represent the interaction between the residue and its environment.

determining changes in the property values of r_1 due to perturbations to r_2 , wherein the method is performed on a computer system.

App. Br. 20 (Claims App'x).

ISSUES AND ANALYSES

We decline to adopt the Examiner's findings of fact and conclusions that the appealed claims are directed to nonstatutory subject matter. We address the arguments raised by Appellants below.

Issue

Appellants argue, *inter alia*, that the Examiner erred because the claims are not directed to a judicial exception. App. Br. 11.

Analysis

The Examiner finds the claims are directed to processing information through mathematical correlations and converting one form of numerical representation into another and, as such, are directed to an abstract idea that is a judicially-created exception to 35 U.S.C. § 101. Final Act. 3.

Specifically, the Examiner finds: (1) the claims do not include additional elements that are sufficient to amount to significantly more than the judicial exception; (2) the claims do not recite inventive steps outside of data manipulation, or improvements to the functioning of the computer itself; and (3) there are no meaningful limitations in the claims, beyond generally linking the use of an abstract idea to a particular technological environment, which transform the judicial exception into a patent-eligible

application such that the claim amounts to significantly more than the exception itself. Final Act. 3–4. Furthermore, the Examiner finds that the claims do not purport to improve the functioning of the computer itself and, therefore, do not provide significantly more than a generic computer upon which the claimed method steps are executed. *Id.* at 4.

Appellants point to the test set forth by the Supreme Court for subject matter eligibility of a claimed method in *Alice Corporation Pty. Ltd. v. CLS Bank International*, 134 S.Ct. 2347 (2014). Appellants assert that the two-part *Alice* test requires the Examiner to: (1) determine whether the claim is “directed to” a judicial exception, e.g., an abstract idea; and, (2) if so, to determine whether any element, or combination of elements, in the claim is sufficient to ensure that the claim amounts to significantly more than the judicial exception. App. Br. 10. Furthermore, Appellants point to our reviewing court’s further holding that, under the first prong of the *Alice* test, “[t]he ‘directed to’ inquiry ... cannot simply ask whether the claims *involve* a patent-ineligible concept.” *Id.* (quoting *Enfish, LLC. v. Microsoft Corp.*, 822 F.3d 1327, 1334–35 (Fed. Cir. 2016) (emphasis in original), also citing *Mayo Collaborative Services v. Prometheus Laboratories, Inc.*, 566 U.S. 66, 71 (2012) (“For all inventions at some level embody, use, reflect, rest upon, or apply laws of nature, natural phenomena, or abstract ideas”)). Rather, Appellants assert, the question is whether, “considered in light of the specification ... [the claims’] ‘character as a whole is *directed* to excluded subject matter.” *Id.* (emphasis in original) (quoting *Internet Patents Corp. v. Active Networks, Inc.*, 790 F.3d 1343, 1346 (Fed. Cir. 2015)).

Appellants argue that the claims on appeal are directed to a complex method for modeling a protein system that includes meaningful limitations

including: (1) applying a set of perturbations P_1 to a set of residues r_2 , where the perturbations are alterations to the structure of the residues; (2) optimizing a quality function Q , using an atomistic force field by modifying the conformation of residues r_1 and r_2 in a constrained environment; (3) a constrained environment includes fixed backbones and C_β residues for all residues in the protein system other than residues r_1 and r_2 ; (4) the quality function Q includes a free energy term for r_1 and r_2 ; and (5) application of measure M to r_1 to provide a side-chain conformation value, a backbone conformation value, or a rotamer conformation value of r_1 . App. Br. 11. As such, Appellants argue, the claims do not seek to tie up all methods of processing information through mathematical correlations and converting one form of numerical representation into another, as found by the Examiner. *Id.*

More specifically, Appellants contend that their claimed method does not read on protein modeling that applies perturbations other than those altering the structure of one or more residues, nor does it read on protein modeling that optimizes a quality function other than by using an atomistic force field. App. Br. 12. Appellants assert that their method does not read on protein modeling by which the backbones of all residues are not fixed during optimization or where the C_β atoms of all residues are not fixed during optimization, even if the backbones of residues are fixed. *Id.*

Appellants also argue that their method does not read on protein modeling by which the quality function does not include a free energy term for at least two residues or where a measure is applied to provide a side-chain conformation value, a backbone conformation value, or a rotamer conformation value for a set of residues. *Id.* Therefore, Appellants argue,

claim 1 does not preclude others from atomic modeling of a protein system using conventional methods; rather, the claimed method is a specific solution to a problem in the rational protein design and modeling arts that significantly reduces the computational resources required for protein modeling. *Id.*

It is Appellants' contention, furthermore, that, when analyzed under the framework established by the Supreme Court in *Alice*, the claimed method is patentable because it is not directed to an abstract idea and includes significantly more than any of the enumerated judicial exceptions. App. Br. 13, 16. Specifically, Appellants point to our reviewing court's holding in *Enfish* that: "claims directed to software, as opposed to hardware, are [not] inherently abstract Software can make non-abstract improvements to computer technology." *Id.* at 13 (quoting *Enfish*, 822 F.3d at 1335–36).

According to Appellants, claim 1 is patent eligible because, as with the claims in *Enfish*, it is drawn to an improvement in computer functionality. Specifically, claim 1 allows for dramatically faster modeling of coupling interactions between residues in a protein system. *Id.* Appellants dispute the Examiner's finding, therefore, that claim 1 is directed to a method for "processing information through mathematical correlations" and/or "converting one form of numerical representations into another." *Id.* at 14. To the contrary, Appellants argue, their claims are focused on a specific solution to a problem in the rational protein design and modeling arts, i.e., that conventional methods for modeling protein interactions are computationally taxing. *Id.* Appellants assert that, because claim 1 is directed to this specific method, which improves computer functionality by

allowing faster modeling or residue interactions in a protein system rather than merely processing information through mathematical correlations and converting numerical representations, the character of the claim as a whole is not directed to excludable subject matter. *Id.* at 15.

Appellants also argue that claim 1 includes more than merely the judicial exceptions enumerated in *Alice*. App. Br. 16. Appellants assert that the “significantly more” analysis set forth in *Alice* turns on whether performance of a particular claim element, and its combination with any additional claim element, was a “well-understood, routine, conventional activity previously engaged in by scientists in the field.” *Id.* (quoting USPTO, *Update: Memorandum - Recent Subject Matter Eligibility Decisions 4*, <https://www.uspto.gov/sites/default/files/documents/ieg-may-2016-fr.pdf> (2016) (“May 16, 2016, Update”)).

Appellants contend that claim 1 includes significantly more because it has an “inventive concept” that applies the alleged judicial exception of “processing information through mathematical correlations and converting one form of numerical representation into another” in a meaningful way that provides an improvement in the field of rational protein design and modeling. App. Br. 16. Appellants assert that, by improving computer functionality, the claimed invention significantly reduces the time and computing resources required to model coupling interactions between pairs of residues in a protein system, as explained *supra*. *Id.* Appellants assert that their claimed method was thus not a well-understood, routine, or conventional activity previously engaged in by scientists in the field. *Id.*

The Examiner responds that Appellants adduce no evidence that the functionality of the computer-implemented method recited in their claims—as

opposed to the number of steps executed by the computer—is at all affected by the method steps. Ans. 2. The Examiner observes that a computer that runs “shorter lines of code is obviously faster, but does not improve functionality of the computer.” *Id.*

The Examiner finds that the method recited by Appellants’ claims are drawn to processing information and converting one form of numerical representation into another by organizing information through “mathematical concepts such as mathematical algorithms, mathematical relationships, mathematical formulas, and calculations.” Ans. 2. Therefore, the Examiner finds the steps of the claimed method are directed to an abstract idea that is a recognized judicial exception and not patentable. *Id.*

We are not persuaded that the Examiner has established a *prima facie* case that the claims are not patentable under the exceptions to 35 U.S.C. § 101. Appellants do not dispute that the claims are directed to a computer-implemented method, i.e., a modeling program of determining changes in a set of amino acid residues in a protein system resulting from perturbations made to a second set of residues under rigidly-defined conditions. *See* Abstr. The question before us, then, is whether such a modeling program, executable on a standard computer, is patentable under § 101.

Section 101 defines patent-eligible subject matter as “any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof,” subject to the other limitations of the Patent Act. 35 U.S.C. § 101. The courts have created judicial exceptions to the literal scope of § 101, *viz.*: “Laws of nature, natural phenomena, and abstract ideas are not patentable.” *Alice*, 134 S.Ct. at 2354 (quoting *Ass’n for Molecular Pathology v. Myriad Genetics, Inc.*, 133 S.Ct. 2107, 2116

(2013)). The Examiner finds that Appellants' claims fall under the abstract idea exception.

The framework set forth by the Supreme Court in *Alice* has been summarized by our reviewing court in *McRO, Inc. v. Bandai Namco Games America Inc.*, 837 F.3d 1299, 1311–12 (Fed. Cir. 2016). In *Alice*, the Court applied a two-step framework for analyzing whether claims are patent eligible. First, the panel must determine whether the claim at issue is “directed to” a judicial exception, such as an abstract idea, including mathematical formulae. *See Alice*, 134 S.Ct. at 2355; *Gottschalk v. Benson*, 409 U.S. 63, 64 (1972). The abstract idea exception prevents patenting a result where “it matters not by what process or machinery the result is accomplished.” *O’Reilly v. Morse*, 56 U.S. 62, 113 (1853). However, we do not automatically assume that such claims are directed to patent ineligible subject matter because “all inventions at some level embody, use, reflect, rest upon, or apply laws of nature, natural phenomena, or abstract ideas.” *Mayo*, 566 U.S. at 71 (2012). Instead, we analyze “the claims ... in their entirety to ascertain whether their character as a whole is directed to excluded subject matter.” *Internet Patents Corp.*, 790 F.3d at 1346. If we determine the claims are directed to an abstract idea, then the inquiry proceeds to the second step of the *Alice* framework. *Alice*, 134 S.Ct. at 2355.

In step two, we consider whether the claims contain an “inventive concept” sufficient to “transform the nature of the claim into a patent-eligible application.” *Alice*, 134 S.Ct. at 2355 (quotation omitted). To do so, we must look to both the claim as a whole and the individual claim elements to determine whether the claims contain “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.* (quoting *Mayo*, 566 U.S. at 71–72) (alteration in original).

The Examiner finds that Appellants’ claims are drawn to “processing information and converting one form of numerical representation into another by organizing information through mathematical concepts such as mathematical algorithms, mathematical relationships, mathematical formulas, and calculations” and are therefore drawn to an ineligible abstract idea. Ans. 2. Claims have been held ineligible by our reviewing court as being directed to an abstract idea when they merely collect electronic information, display information, or embody mental processes that could be performed by humans. *Thales Visionix Inc. v. United States*, 850 F.3d 1343, 1346–47 (Fed. Cir. 2017) (citing *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1353–54 (Fed. Cir. 2016) (collecting cases)). However, our reviewing court has also admonished us that we “must be careful to avoid oversimplifying the claims” by looking at them generally and failing to account for the specific requirements of the claims.” *McRO*, 837 F.3d at 1313 (citing *In re TLI Commc’ns LLC Patent Litig.*, 823 F.3d 607, 611 (Fed. Cir. 2016)).

Furthermore, a central concern of Section 101, and its judicially-created exceptions, is the prevention of preemption, by which claims are not directed to a specific invention, but rather improperly monopolize “the basic tools of scientific and technological work.” *McRO*, 837 F.3d at 1314 (citing *Alice*, 134 S.Ct. at 2354 (quoting *Myriad*, 133 S.Ct. at 2116)). The abstract idea exception has been applied to prevent patenting of claims that abstractly

cover results where “it matters not by what process or machinery the result is accomplished.” *Id.* (citing *O’Reilly*, 56 U.S. at 113); *Mayo*, 566 U.S. at 84)). We must therefore look to whether the claims on appeal focus on a specific means or method that improves the relevant technology, or are instead directed to a result or effect that is itself the abstract idea and that merely invokes generic processes and machinery. *Id.* (citing *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1336 (Fed. Cir. 2016); *Rapid Litig. Mgmt. Ltd. v. CellzDirect, Inc.*, 827 F.3d 1042, 1048 (Fed. Cir. 2016)).

In the appeal before us, the claims are limited to rules with specific requirements. Specifically, Appellants’ claim 1 requires:

[] applying the respective perturbation p_i to r_2 , wherein the respective perturbation is an alteration to the structure of one or more residues of r_2 ;

[] optimizing, responsive to the applying (a) and using an atomistic force field for the entire protein system, a quality function Q by modifying the conformation of residues of r_1 and r_2 in a constrained environment in which the backbone of all residues in the protein system apart from the residues in r_2 and r_1 are fixed during the optimization and in which C_β atoms of all residues, other than glycine residues and proline residues, in the protein system apart from the residues in r_2 and r_1 are fixed during the optimization and, wherein the quality function Q comprises a free energy term for r_1 and r_2 ; and

[] applying, upon completion of the optimizing[], a measure M to r_1 thereby providing a physical property value v_i of r_1 , wherein the physical property value is a side-chain conformation value, a backbone conformation value, or a rotamer conformation value, and wherein the measure M comprises an enumeration of the residues in r_1 that exhibit an altered property after application of one or more perturbations to the residues of r_2 and optimization of Q , thereby obtaining a

first set of property values $V_1 = \{v_1, \dots, v_n\}$ for r_1 , and thereby determining changes in the property values of r_1 due to perturbations to r_2 , wherein the method is performed on a computer system.

The specific, claimed features of these rules thus permit the improvement realized by the invention, i.e., an improved method of determining the effects of perturbations on one set of amino acid residues r_2 in a protein upon another set of residues r_1 , under certain conditions and assumptions. *See McRO*, 837 F.3d at 1313.

Claim 1 is thus focused on a specific articulated improvement in protein modeling, i.e., “determin[ing] ... positions in a polypeptide (or protein) that are likely to be intrinsically coupled, irrespective of the amino acid type at that position, or the coupling between specific amino acids in the polypeptide sequence.” Spec. ¶ 6. We are therefore not persuaded by the Examiner’s finding that the claims simply use a computer as a tool to automate generic conventional activity, i.e., “converting one form of numerical representation into another by organizing information through mathematical concepts.” *See Ans. 2*. Rather, the novel inventive concept of the claimed method is a new manner of predicting alterations in one set of amino acid residues as a result of perturbations to a second set of residues under a specified set of conditions and assumptions. Although the rules recited in claim 1 are embodied in computer software that can be processed by a general-purpose computer, the Examiner adduces no evidence that the process required by the claims is the same as any process previously used in protein modeling and conducted by similar or other means. Indeed, the Examiner provides no evidence that the method recited in claim 1 of

quantitatively determining how perturbations to one set of amino acid residues affects another set in a protein system has ever been practiced by those of skill in the art of protein structure and design, whether with a computer, paper and pencil, or mentally. Consequently, and unlike cases such as *Alice*, the Examiner has not shown that the computer-automated method of claim 1, and any prior method, were carried out in the same way. *See Alice*, 134 S.Ct. at 2356; *see also Parker v. Flook*, 437 U.S. 584, 585–86 (1978); *Bilski v. Kappos*, 561 U.S. 593, 611 (2010); *McRO*, 837 F.3d at 1314.

We therefore find the claims before us to be distinguishable from those in *Alice* and related cases, in which the computer-implemented method was responsible for merely “organizing [existing] information into a new form” or carrying out a previously-known and fundamental economic practice. *McRO*, 837 F.3d at 1315 (citing *Digitech Image Techs., LLC v. Elecs. for Imaging, Inc.*, 758 F.3d 1344, 1351 (Fed. Cir. 2014); *Alice*, 134 S.Ct. at 2356). Appellants’ claimed method uses a combined order of specific rules that render information into a specific format that is then used and applied to create desired results: a determination of the effect upon an amino acid residue r_1 when another residue r_2 is perturbed. We acknowledge that the results of Appellants’ claimed method are not, in themselves, tangible, but there is nothing that requires a method “be tied to a machine or the transformation of an article” to be patentable. *Bilski*, 561 U.S. at 603 (discussing 35 U.S.C. § 100(b)).

Nor do we find that Appellants’ claims would preempt any judicially-created exception to Section 101. Rather, Appellants’ claims are directed to a specific, computer-implemented process of protein modeling with specific

rules directed to that end. Appellants have explained, as we have related *supra*, why the specific method recited in the claims does not “[improperly monopolize] the basic tools of scientific and technological work” (*see Alice*, 134 S.Ct. at 2354) and the Examiner has not adduced any findings to rebut Appellants’ arguments. *See App. Br. 12.*

In summary, then, we find that Appellants’ claims are directed and limited to a specific process which, though perhaps producing an intangible result, are directed not to a computer-implemented version of a previously known and familiar method re-organization of data into a new form or a fundamental economic process, but rather to a method of calculating a result within the context of a specific set of limiting rules and assumptions in a method that is fundamentally new and inventive. We consequently conclude that Appellants’ claimed method does not fall within a judicially-created exception to Section 101. *See McRO*, 837 F.3d at 1315. Accordingly, we reverse the Examiner’s rejection of the claims.

DECISION

The Examiner’s rejection of claims 1, 5, 6, 9, 13, 14, 19, 20, 24, and 29–33 as unpatentable under 35 U.S.C. § 101 is reversed.

REVERSED