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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* CHRISTOPHER DOONA, FLORENCE FEEHERRY,  
EDWARD ROSS, and KENNETH KUSTIN

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Appeal 2018-000776  
Application 12/551,596  
Technology Center 1600

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Before JEFFREY N. FREDMAN, DEBORAH KATZ, and JOHN G. NEW,  
*Administrative Patent Judges.*

KATZ, *Administrative Patent Judge.*

DECISION ON APPEAL

Appellants<sup>1</sup> seek our review, under 35 U.S.C. § 134(a), of the Examiner’s decision to reject claims 1–6, 8–13, and 15–21 (Appeal Brief filed May 9, 2017 (“App. Br.”) 2.)

We have jurisdiction under 35 U.S.C. § 6(b). We affirm-in-part.

Appellants’ Specification is directed to a Quasi-chemical method of modelling microbial growth rates used to predict conditions assuring the safety of foods. (*See Spec.* ¶¶ 37–38). The “Quasi-chemical model is a mechanistic-based mathematical model that applies appropriate sequences of chemical reactions or biochemical processes to more accurately and meaningfully represent” a bacteriological lifecycle. (*Spec.* ¶ 5). Appellants use this model to ensure food safety and determine shelf-life by predicting microbial growth and controlling food processing and temperature control technologies.

Appellants’ claim 18 recites:

A method comprising:

inputting, into a computer comprising a microprocessor executing instructions stored on the computer, experimentally measured data pair vectors comprising time (td) vector and corresponding population count (xd) vector;

inputting, into the computer, initial values of rate constant estimates comprising a k-vector of at least six numerical values ( $k_1, k_2, k_3, k_4, k_5, k_6 \dots k_n$ );

storing each of the td vector, xd vector and k-vector values in memory of the computer for use in a Quasi-chemical kinetics growth-death-tailing model wherein the model is

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<sup>1</sup> Appellants report that the real party in interest is Brandeis University.

defined by five rate equations derived from a hypothetical mechanism of reaction steps of biochemical processes:

Reaction Steps	Rate equations
$Q \rightarrow M$	$dQ/dt = - (v_1 + v_5) = (k_1 + k_5)Q$
$M \rightarrow 2M + E$	$dM/dt = v_1 + v_2 - v_3 - v_4 = k_1Q - M(G - \xi E)$
$M + E \rightarrow D$	$dE/dt = (v_2 - v_3) = M(k_2 - \xi E)$
$M \rightarrow D$	$dD/dt = (v_3 + v_4 + v_5) = M(k_4 + \xi E) + k_6R$
$Q \rightarrow R$	$dR/dt = (v_5 - v_6) = k_5Q - k_6R$
$R \rightarrow D$	

where Q represents quiescent organisms, M represents cells activated for cell division and multiplication, E is an extracellular lethality factor, cells, D is dead cells, and R represents cells with increased resistance,

selecting a non-linear curve-fitting routine stored in the memory of the computer;

repeatedly:

integrating in the microprocessor of the computer the Quasi-chemical kinetics growth-death-tailing model with each of the td vector, xd vector and k-vector values to obtain a calculated population data (U) using the nonlinear curve-fitting routine; and

varying each of k-vector values ( $k_1, k_2, k_3, k_4, k_5, k_6 \dots k_n$ );

comparing the calculated population data (U) to the measured td vector and xd vector values until a predetermined fitting criterion is reached that signifies no further meaningful improvement has occurred to achieve a curve-fit and thereby signifies a fit of the model to the td vector and xd vector values; and

delivering the informational composite to a food processing technology to process a storable food product to render the storable food product safe for consumption.

(App. Br. 8–10.) Appellants’ independent claim 1 is similar to claim 18, but includes, *inter alia*, the step<sup>2</sup> of:

delivering, as an input to control a food processing technology or a temperature controlled food storage technology, an output of the computer comprising the storable food product as a microbiologically safe food product with a date of use after which the microbiologically safe food product needs to be destroyed.

(App. Br. 2–4.) Appellants’ independent claim 8 is similar to claim 18, but includes, *inter alia*, the step of: “controlling operation of a food processing technology or temperature-controlled storage technology using the informational composite to determine whether the storable food product is safe for consumption.” (App. Br. 5–7.)

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<sup>2</sup> We note that the step of “delivering . . . an output of the computer comprising the storable food product . . .” could reasonably be interpreted to mean a computer that outputs food. As noted by the panel of conferees from the Pre-Appeal Brief Review, this limitation should be considered under 35 U.S.C. §§ 112, first and second paragraphs, if prosecution continues. (*See* Examiner-Initiated Interview Summary, issued May 2, 2017.)

The Examiner rejects the claims under 35 U.S.C. § 101 as being drawn to ineligible subject matter. (Final Office Action mailed December 16, 2016 (“Final Act.”) 2.)

*Analysis*

Although 35 U.S.C. § 101 provides that “[w]hoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor ...,” the Supreme Court has determined that there are exceptions to what is patentable. Specifically, “laws of nature, natural phenomena, and abstract ideas” are not eligible subject matter. *See Diamond v. Diehr*, 450 U.S. 175, 185 (1981). To determine if claimed subject matter is statutorily eligible in light of these judicial exceptions the Supreme Court has articulated a two-step framework in *Mayo Collaborative Services v. Prometheus Labs., Inc.*, 566 U.S. 66 (2012) and later cases. Specifically,

[f]irst, we determine whether the claims at issue are directed to one of those patent-ineligible concepts . . . . If so, we then ask, “[w]hat else is there in the claims before us?” . . . To answer that question, we consider the elements of each claim both individually and “as an ordered combination” to determine whether the additional elements “transform the nature of the claim” into a patent-eligible application.

*Alice Corp. Pty. v. CLS Bank Int’l*, 134 S. Ct. 2347, 2355 (2014) (quoting *Mayo*, 566 U.S. at 78.

The PTO recently published revised guidance on the application of § 101. USPTO’s January 7, 2019 Memorandum, *2019 Revised Patent Subject Matter Eligibility Guidance*, 84 Fed. Reg. 50–57 (2019) (“2019

Guidelines”). After determining that claimed subject matter falls within the four categories of patentable subject matter identified in 35 U.S.C. § 101, the 2019 Guidelines provides a “revised step 2A” to determine whether a claim is directed to a judicial exception. (*See* 2019 Guidelines, 84 Fed. Reg. 50, 53–54.) In a first prong of revised step 2A, the Examiner must determine whether the claim recites a judicial exception. (*See id.* at 54.) Judicial exceptions include abstract ideas, defined as “mathematical concepts,” “certain methods of organizing human activity,” and “mental processes.” (*Id.* at 52.) If the judicial exception identified in the first prong is an abstract idea, the examiner then moves to a second prong of revised step 2A, to determine whether the judicial exception is integrated into a practical application. (*See id.*) If so, the inquiry ends and the claim is determined to be directed to eligible subject matter under the 2019 Guidelines. (*See id.* at 54 (“When the exception is so integrated [into a practical application], then the claim is not directed to a judicial exception (Step 2A: NO) and is eligible. This concludes the eligibility analysis.”).)

The Examiner finds Appellants’ claimed methods as a whole “relies on the abstract ideas of performing mathematical calculations that are intended to model a microbial population growth-death rate.” (Final Act. 3.) The Examiner also finds the claims “further recite reviewing information” which is a mental process. (*Id.* at 2)

Having determined that the claims are directed to a judicial exception, the Examiner finds that Appellants’ claims do not include additional elements that are significantly more than the judicial exception. (Final Act. 3.) The Examiner finds that collecting a plurality of samples from a

microbial population and inputting pairs of microbial counts to be pre-resolution steps of data gathering. (*Id.*) The Examiner further finds that it is well-understood, routine, and conventional to use a generic computer, microprocessor, and user interface for sending calculated information as part of a larger system of process control. (*Id.*) Thus, according to the Examiner, the claims are unpatentable under 35 U.S.C. § 101.

Appellants dispute the Examiner's findings, arguing that the claims are not directed to a judicial exception without significantly more than an abstract idea. (*See App. Br. 10.*) Appellants first argue that the Examiner described the claims at a high level of abstraction and thus failed to articulate a reasoned rationale that identifies the judicial exception in the claims. (*See App. Br. 14–15.*) Appellants argue that the Examiner has not compared the claims to claims previously found to be directed to an abstract idea in a previous court decision, nor interpreted the claims in view of the specification to determine whether their character as a whole is directed to a patent eligible concept. (*See App. Br. 17.*)

Applying the 2019 Guidelines, we first look to see if the claims recite any judicial exceptions. Here we find the claims recite a mathematical concept, in particular, mathematical formulas as listed in the 2019 Guidelines. (*See 84 Fed. Reg. at 52.*) In this way the claims are similar to claims analyzed in *Diehr and Parker v. Flook*, 437 U.S. 584, 594–595 (1978). The mathematical formulas in the claims include rate equations derived from a hypothetical mechanism of reaction steps. The claims further recite integrating the model with each vector value using a non-linear curve-fitting routine, which are known mathematical operations. Because the

claims recite a mathematical concept, we find that the claims recite the judicial exception of an abstract idea in the first prong of the revised Step 2A of the 2019 Guidelines. (*See* 2019 Guidelines, 84 Fed. Reg. at 51–52.)

We next consider whether any additional elements integrate the judicial exception into a practical application. (*See* 2019 Guidelines, 84 Fed. Reg. 54–55.) The Appellants argue the claims include an improvement to technology, for example, “an improvement over existing modeling systems that are not enhanced versions of Quasi-chemical models represented in the recited table, which are capable of accurately fitting even more complex kinetic data.” (App. Br. 19, citing Spec. ¶ 40.) Appellants further argue that the claims are directed to a particular solution of a problem, namely determining the “safety and shelf-life of a storable food product for consumption using a microbiological Quasi-chemical kinetics growth-death tailing model based on differential equations.” (App. Br. 20.) The Specification states “the disclosed method permit workers skilled in Predictive Microbiology to use this information to predict food formulations to inhibit microbial growth or processing conditions to ensure microbial destruction and assure consumers.” (Spec. ¶ 42.)

The 2019 Guidelines explain that additional elements that integrate the judicial exception into a practical application can be an element that “implements a judicial exception with, or uses a judicial exception in conjunction with, a particular machine or manufacture that is integral to the claim.” (2019 Guidelines, 84 Fed. Reg. at 55, citing Manual of Patent Examining Procedure § 2106.05(a)–(c), (e)–(h).) In an example from the case law, the claims in *Diehr* recited a method for operating a rubber-

molding press including the step of “opening the press automatically when a said comparison [of calculated cure time vs. elapsed time] indicates equivalence.” *See Diehr*, 450 U.S. at 179 n.5. Thus, the recited mathematical equation had the practical application of automatically operating a press.

Similarly, claim 1 at issue recites the step of: “delivering, as an input to control a food processing technology or a temperature controlled food storage technology, an output of the computer comprising the storable food product as a microbiologically safe food product with a date of use after which the microbiologically safe food product needs to be destroyed.” Thus, under prong two of revised Step 2A of the 2019 Guidelines and the Supreme Court precedent of *Diehr*, claim 1 integrates the judicial exceptions, i.e., the mathematical equations, into the practical application of food safety by delivering a microbiologically safe food product with a date of use.

Likewise, claim 8 at issue recites the step of: “controlling operation of a food processing technology or temperature-controlled storage technology using the informational composite to determine whether the storable food product is safe for consumption.” Again, under prong two of revised Step 2A and the Supreme Court precedent of *Diehr*, claim 8 integrates the judicial exception into the practical application of food safety by controlling the operation of a food process technology or temperature-controlled storage technology.

We conclude that the abstract idea recited in independent claims 1 and 8 is integrated into the practical application of improving food safety technology recited in the claims. Thus, we conclude that these claimed

methods are patent-eligible and do not sustain the Examiner's § 101 rejection of claims 1–6, 8–13, and 15–17 and 19–20 as being drawn to patent-ineligible subject matter.

Claim 18 is less straight forward because claim 18 does not include an express step of controlling the operation of another device or any other express step of using the information derived from the mathematical equation in conjunction with a particular machine or manufacture. Nevertheless, claim 18 recites the express step of “delivering the informational composite to a food processing technology to process a storage food product to render the storable food product safe for consumption.” The step of delivering information implicates “mere instructions to apply an exception.” In *Alice* a method claim including, *inter alia*, the step of “issuing irrevocable end-of-day instructions to the exchange institutions to carry out the permitted transactions” was held to be ineligible. (*See Alice*, 573 U.S. at 224.) Like the claim in *Alice*, claim 18 recites only delivery of information, without any additional limitation that integrates delivery of such information into a practical application.

Under the 2019 Guidelines, if a claim reciting a judicial exception includes a limitation that integrates the exception into a practical application, it is not directed to a judicial exception. (*See* 2019 Guidelines, 84 Fed. Reg. at 54.) But, because claim 18 fails to recite an additional limitation that achieves any of the results exemplified in the 2019 Guidelines, we determine that claim 18 is directed to the judicial exception of a mathematical concept. (*See id.* at 55 (exemplifying practical applications as improvement in the functioning of a computer, treatment or prophylaxis of disease, use of a

particular machine, transformation or reduction of a particular article, or other linkage to a particular technological environment).)

Because claim 18 is directed to a judicial exception, we evaluate whether the claim provides an inventive concept, i.e., whether the additional elements amount to significantly more than the exception itself, as required in *Alice*. (See 2019 Guidelines, 84 Fed. Reg. at 56.) As discussed above, the Examiner found the additional limitations of inputting data were directed to pre-solutions steps of data gathering, and the additional limitation of sending calculated information to a generic computer for process control were routine and conventional. (See Final Act. 3).

Appellants do not present arguments specific to claim 18, generally referring, instead, to arguments presented for claim 1. (See App. Br. 36–37).

For example, Appellants argue that:

in the independent claims, the input of a plurality of time-dependent microbial data from a plurality of samples collected from a microbial population with a storable food product is transformed into a computer output comprising the storable food product as a microbiologically safe food product with a date of use after which the microbiologically safe food product needs to be destroyed. This, in turn, is transformed into an input to control a food processing technology or a temperature-controlled food storage technology.

(App. Br. 27). However, claim 18 does not recite either computer output or controlling a food processing technology. Therefore, these arguments do not apply to claim 18.

Likewise, Appellants argue that the claims include an innovation in computer technology, including improvements to the computer itself, as well as improvements to computer science, and food storage and preservation

technologies. (App. Br. 26, citing *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327 (Fed. Cir. 2016), *McRO, Inc. v. Bandai Namco Games America Inc.*, 837 F.3d 1299 (Fed. Cir. 2016) and *Bascom Global Internet Serv., Inc. v. AT&T Mobility LLC*, 827 F.3d 1341 (Fed. Cir. 2016). Our reviewing court in *McRO* and *Enfish* found that the claims were not directed to a judicial exception. Thus, the analysis in these cases did not extend to a determination of whether the additional elements amount to significantly more than the exception itself. *See McRO*, 837 F.3d at 1316; *see also Enfish*, 822 F.3d at 1339. Therefore, these cases are not relevant to analyzing claim 18 of whether the additional elements of claim 18 amount to significantly more than the exception itself.

In *Bascom*, our reviewing court found that while the claims of the patent were directed to an abstract idea, the patentee alleged an “inventive concept can be found in the ordered combination of the claim limitations that transform the abstract idea of filtering content into a particular, practical application of that abstract idea.” *Bascom*, 827 F.3d at 1352. In particular, the patent claimed “a technology-based solution (not an abstract-idea-based solution implemented with generic technical components in a conventional way) to filter content on the Internet that overcomes existing problems with other Internet filtering systems.” *Id.* at 1351. Claim 18 is immediately distinguishable, as it recites an abstract-idea-based solution, that is, a mathematical equation, implemented with generic technical components (MATLAB® software), in a conventional way. (*See Spec.* Figure 4; ¶¶ 43, 58, 60). Therefore, we are not persuaded that ordered combinations of steps in claim 18 provide an inventive concept. *See* 84 F3d. Reg. 56.

Because we conclude that the abstract idea recited in claim 18 is not integrated into a recited practical application and does not provide an inventive concept, we conclude that the claimed method is not eligible. Thus, we sustain the Examiner's § 101 rejection of claims 18 and 21 as being drawn to patent-ineligible subject matter.

*Conclusion*

Upon consideration of the record and the reasons given, the rejection of claims 1–6, 8–13, and 15–21 under 35 U.S.C. § 101 is not sustained. The rejection of claims 18 and 21 under 35 U.S.C. § 101 is sustained

Therefore, we affirm-in-part the decision of the Examiner.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136.

AFFIRMED-IN-PART