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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* ASHRAF ISMAIL, JONAH PREVOST KIRKWOOD,  
JACQUELINE SEDMAN, ANDREW GHETLER,  
and TOM PINCHUK<sup>1</sup>

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Appeal 2014-005477  
Application 11/630,856  
Technology Center 1600

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Before FRANCISCO C. PRATS, JOHN E. SCHNEIDER,  
and TIMOTHY G. MAJORS, *Administrative Patent Judges*.

MAJORS, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 involving claims to methods of using multi-pixels spectral images to identify microorganisms that have been rejected as directed to non-statutory subject matter, and as anticipated and obvious over the prior art. We have jurisdiction under 35 U.S.C. § 6(b).

We reverse.

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<sup>1</sup> Appellants identify the Real Party in Interest as McGill University. (App. Br. 2.)

### STATEMENT OF THE CASE

The Specification discloses “[a] rapid method for characterizing and identifying microorganisms using Focal-Plane Array (FPA)–Fourier Transform Infrared (FTIR) spectroscopy.” (Spec. Abstract.) In an embodiment of the invention, “[m]ulti-pixels spectral images of unknown microorganisms[’] spectra are analyzed and compared to spectra of reference microorganisms in databases.” (*Id.*)

Claims 1 and 3–20 are on appeal. Claim 1 is illustrative:

1. A method for characterizing a microorganism said method comprising:
  - a) obtaining at least one multi-pixels spectral image of a sample of said microorganism, wherein each pixel of said multi-pixels spectral image has a corresponding spectrum;
  - b) selecting one or more spectra from said multi-pixels spectral image, wherein said selecting is based on one or more spectral characteristics of said corresponding spectrum; and
  - c) identifying said microorganism by comparing said one or more selected spectra with spectra of reference microorganisms from a database to determine an identity of said microorganism.

(App. Br. 17 (Claims App’x).)

The claims stand rejected as follows:<sup>2</sup>

Claims 1, and 3–19 under 35 U.S.C. § 101 for being drawn to non-statutory subject matter.

Claims 1, 3, 4, 6–17, and 19–20 under 35 U.S.C. § 102(b) as anticipated by Cabib et al., (US 5,784,162, issued July 21, 1998) (“Cabib”).

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<sup>2</sup> The Examiner withdrew the rejection of claims 10, 11, and 20 under 35 U.S.C. § 112, second paragraph. (Ans. 2.)

Claim 5 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Cabib in view of Beattie.<sup>3</sup>

Claim 18 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Cabib in view Lewis.<sup>4</sup>

On appeal, we determine whether the Examiner established, by a preponderance of the evidence, that the claims are unpatentable under each of these rejections.

## DISCUSSION

### *Patentable Subject Matter – 35 U.S.C. §101*

Section 101 of the Patent Act 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, subject to the conditions and requirements of this title.” 35 U.S.C. § 101. There are, however, “three specific exceptions to §101’s broad patent-eligibility principles: ‘laws of nature, physical phenomena, and abstract ideas.’” *Bilski v. Kappos*, 561 U.S. 593, 601 (2010) (quoting *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980)). Claims directed to such “building blocks of human ingenuity” are not subject to patent protection because monopolizing the building block itself

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<sup>3</sup> Beattie et al., *Discrimination among Bacillus cereus, B. myocoides and B. thuringiensis and some other species of the genus Bacillus by Fourier transform infrared spectroscopy*, 164 FEMS MICROBIOLOGY LETTERS 201–206 (1998) (“Beattie”).

<sup>4</sup> Lewis et al., *Fourier Transform Spectroscopic Imaging Using an Infrared Focal-Plane Array Detector*, 67 ANALYTICAL CHEMISTRY 3377–3381 (1995) (“Lewis”).

would tend to impede rather than promote innovation — “thwarting the primary object of the patent laws.” *Alice Corp. Pty. Ltd. v. CLS Bank Int’l*, 134 S. Ct. 2347, 2354 (2014). Nevertheless, “an invention is not rendered ineligible for patent simply because it involves [for example] an abstract concept.” (*Id.*) To the contrary, claims that integrate such building blocks into something more may be patentable. (*Id.*)

The Supreme Court has set forth a “framework for distinguishing patents that claim laws of nature, natural phenomena, and abstract ideas from those that claim patent-eligible applications of those concepts.” (*Id.*) According to that framework, first “we determine whether the claims at issue are directed to one of those patent-ineligible concepts.” (*Id.* at 2355) “If so, we then ask, ‘[w]hat else is there in the claims before us?’” (*Id.* (quoting *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1297 (2012).) To answer this second 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. [The Supreme Court has] 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.* (internal citations and quotation marks omitted).)

The Examiner rejected claims 1 and 3–19 under 35 U.S.C. § 101 as directed to non-statutory subject matter. (6/24/2013 Office Action (“Non-Final Act.”) 2–3.) The Examiner finds the claims recite “methods for characterizing a microorganism by determining an identity of an organism”

through “empirical and data analysis and acquisition steps [that] are well-understood, conventional, and routine in diagnosing imaging microorganisms.” (*Id.*) As such, the Examiner finds “there is no clear-cut practical application of the objective of the claim” and thus concludes the claims are drawn to a patent-ineligible “law of nature/natural principle.” (*Id.* at 3.)

In the Answer, the Examiner maintains the rejection and adds that “claims 1 and 3–19 recite neither a physical transformation nor a critical tie of a significant step to a particular machine.” (Ans. 2–3.) So, according to the Examiner, “the claims involve the abstract idea of data manipulation.” (*Id.* at 3.)

Appellants argue the Examiner has not sufficiently explained the rejection, leaving the rejection unclear — both as to what aspect of the claims involve “empirical observation,” and what exactly is considered the “natural principle.” (App. Br. 6.) Appellants further contend that in the claims “[e]ach pixel in a multi-pixels spectral image of a sample has a corresponding spectrum, which would be obtained by spectral analysis as opposed to empirical observation.” (*Id.* at 6.) Also, Appellants argue, the Examiner has not adequately supported the rejection with a proper two-step analysis:

Two steps in analyzing whether a process claim is directed to a natural phenomenon are determining whether the claim focus on use of a natural principle as a limiting element or step of the claim, and if so, whether the claim includes additional elements and/or steps that integrate the natural principle into the claimed invention such that the natural principle is practically applied.

(*Id.* at 5 (citing *Interim Procedure for Subject Matter Eligibility Analysis of Process Claims Involving Laws of Nature* (3 July 2012))); *see also* Reply Br. 5.) Even if some portion of claim 1 involved a natural principle, Appellants argue the entirety of the claim shows that “the natural principle is practically applied” and ties the invention “to a particular machine or apparatus.” (App. Br. 6–7.) According to Appellants, this includes claim elements such as “obtaining at least one multi-pixels spectral image of a sample of said microorganism, wherein each pixel of said multi-pixels spectral image has a corresponding spectrum.” (*Id.* at 6–7.)

On the record before us, we are not persuaded the Examiner met the burden to show the claims are directed to patent-ineligible subject matter. The Examiner’s finding that the claims are directed to a natural principle or, as stated in the Answer, “the abstract idea of data manipulation” lacks sufficient explanation and analysis. Further, as discussed below, the Examiner has not persuaded us that the combination of claim elements lacks an inventive concept sufficient to ensure that in practice the claimed invention “amounts to significantly more than a patent upon the [ineligible concept] itself.” *Mayo*, 132 S. Ct. at 1297.

Though characterizing microorganisms might be described as “abstract,” the Examiner has not persuasively shown that the claims, considered in their entirety, are limited to an abstract idea or natural principle. As Appellants point out, the combination of elements in claim 1, for example, require obtaining a multi-pixels spectral image of a sample, and then selecting a spectra from that image based on its spectral characteristics. Claim 1 further requires the selected spectral data of the sample be

compared with spectral data of reference microorganisms in a database to identify the sample microorganism. Appellants contend these aspects of the claim “would be tied to a particular machine or apparatus for obtaining such an image and/or corresponding spectra of each pixel.” (App. Br. 7.) And, Appellants argue, the claims recite a practical application “of identifying a microorganism by comparing spectra from pixels of the image with spectra from a database, and is not a mere mental process.” (*Id.*) The Examiner responds that “the body of independent claim 1 relies on image data analysis of image data . . . [that] may be interpreted to be obtained empirically” but the Examiner has not adequately explained this contention. (Non-Final Act. 3.) Nor has the Examiner explained how the methods claimed may be accomplished without specialized (i.e., non-abstract) techniques and equipment (such as the FPA-FTIR spectrometer described in the Specification (Spec. 7, ll. 25–28).)

We are similarly unpersuaded that the steps recited in the claims are so conventional and routine that the claims, in their entirety, lack any inventive concept. The Supreme Court has cautioned that the prohibition against patenting ineligible subject matter cannot be circumvented by claim drafting that, in effect, adds nothing of substance to an underlying abstract idea or law of nature. *See, e.g., Bilski*, 561 U.S. at 612 (“limiting an abstract idea to one field of use or adding token postsolution components did not make the concept patentable”); *Alice*, 134 S. Ct. at 2358 (“[M]ere recitation of a generic computer cannot transform a patent-ineligible abstract idea into a patent-eligible invention. Stating an abstract idea while adding the words ‘apply it’ is not enough for patent eligibility.”) (internal quotation marks



omitted). The concern is that such claims would, in effect, still preempt access to the building block itself. *Alice*, 134 S. Ct. at 2358 (“Given the ubiquity of computers . . . wholly generic computer implementation is not generally the sort of additional feature that provides any practical assurance that the process is more than a drafting effort designed to monopolize the [abstract idea] itself.”) (internal citations and quotation marks omitted). But the Examiner has not persuasively demonstrated that the claim elements here add nothing of substance such that the claims stand to preempt any law of nature or abstract idea alone. Instead, as argued by Appellants, the rejected claims include multiple steps directed to a practical application of a particular type of spectral-image analysis.

For the reasons above, we conclude the Examiner did not establish by a preponderance of the evidence that claim 1 and dependent claims 3–19 are unpatentable under 35 U.S.C. § 101.

*Anticipation – 35 U.S.C. § 102(b)*

[U]nless a reference discloses within the four corners of the document not only all of the limitations claimed but also all of the limitations arranged or combined in the same way as recited in the claim, it cannot be said to prove prior invention of the thing claimed and, thus, cannot anticipate under 35 U.S.C. § 102. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008).

The Examiner rejected claims 1, 3, 4, 6–17, 19, and 20 under 35 U.S.C. § 102(b) as anticipated by Cabib. According to the Examiner, Cabib teaches “obtaining a multipixel image, that each pixel has a spectrum . . . and that the method allows spectroscopic measurement of data to be

collected at every pixel simultaneously and independently.” (Non-Final Act. 8 (citing Cabib col. 12, ll. 19–55, claims 1 and 23).). The Examiner finds that “Example 4 in columns 50–52 of Cabib . . . applies this experiment to a plurality of microorganisms.” (Non-Final Act. 8.) The Examiner then finds:

Once the data has been obtained, column 21, lines 23–43 (including Equation 6) of Cabib et al. teaches selecting at least one spectra to be used in the Lambert Beer law equation 6. It is noted that the selecting is based on the spectral characteristics on whether (1) the pixel is in the same spectral cube as the cube of the calculation, (2) a corresponding pixel in a second cube, and (3) the spectrum is within a given library.

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The Lambert Beer law in Equation 6 in column 21 of Cabib et al. compares the selected spectrum (i.e. the reference measured spectrum in the denominator of the equation) with the spectra of the reference microorganisms (e.g. one of the spectra of the microorganisms identified in Example 4 of Cabib et al., represented as the numerator in Equation 6 of Cabib et al.).

(*Id.*) The Examiner further finds “that claims 1, 11, 27, 34, and 42–43 of Cabib et al. use the optical density analysis of Equation 6 of Cabib et al. to characterize and determine identities/properties of organisms.” (*Id.* at 8–9.)

Appellants argue that “[f]or anticipation, there must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of invention.” (App. Br. 14.) According to Appellants, there are multiple differences between the various portions of Cabib cited in the rejection and the rejected claims. For example, Appellants argue “neither Equation 6 nor Example 4 of *Cabib et al.* discloses comparing ‘one or more selected spectra with spectra of reference microorganism from a database to determine an identity of said

microorganism.” (*Id.* at 13.) With respect to Equation 6, Appellants argue “dividing a measured spectrum  $I(\lambda)$  by a measured reference spectrum  $I_o(\lambda)$  to determine optical density of a region of an object does not disclose comparing the measured spectrum and the measured reference spectrum or making such a comparison to identify a microorganism.” (*Id.*) As for Example 4, Appellants argue it “involves construction of spectral similarity maps by calculating the difference between a selected (fluorescence) spectrum in the image and the rest of the spectra (as opposed to spectra of reference microorganism from a database) that composes the rest of the original image.” (*Id.*) Appellants further contend that “Example 4 of *Cabib et al.* relates to spectral imaging based on measurements of the fluorescence intensity of chlorophyll of three different corals for detecting changes of chlorophyll concentration over a small area” and “not some unidentified organism as in claim 1.” (*Id.* at 12–13.)

The Examiner has not met the burden to show that the claims are anticipated by Cabib. Even if we found persuasive the Examiner’s determination that the elements of claim 1, for example, were disclosed at the cited portions of Cabib, those elements must still be pieced together from disparate disclosures throughout the reference to arrive at the claimed subject matter. For example, the Examiner relies on Equation 6 of Cabib, which relates to a calculation of optical density, as disclosing the aspects of the claim concerning comparing selected spectra of a sample with reference spectra. (Ans. 3.) Because one of the three potential inputs in the denominator of Equation 6 is a “spectrum from a library,” the Examiner finds “a library is interpreted to be a database of (presumably previously

collected) spectral data.” (*Id.*) Hence, there is one variant of Equation 6 that is contended to meet the claimed requirement that reference spectra be from a database. But still more is required: to meet other claim elements (e.g., obtaining a multi-pixel spectral image of a sample microorganism, and identifying that microorganism), the Examiner combines the one variant of Equation 6 with other portions of the Specification, particularly Example 4. Yet the Examiner has not adequately explained why data from Example 4 would necessarily be an input to the selected variant of Equation 6 or, vice versa, why this variant of Equation 6 is necessarily used in Example 4. For at least these reasons, the Examiner has not persuaded us that the disclosures in Cabib are “arranged or combined in the same way” as the limitations of claim 1. *See Net MoneyIN*, 545 F.3d at 1371 (Anticipating reference “must clearly and unequivocally disclose the claimed [invention] or direct those skilled in the art to the [invention] without *any* need for picking, choosing, and combining various disclosures not directly related to each other by the teachings of the cited reference.”) (quoting *In re Arkley*, 455 F.2d 586, 587 (CCPA 1972)).

The Examiner’s combination of disclosures in several of Cabib’s claims similarly does not persuade us that claim 1 of the application is anticipated. The Examiner states “that claims 1, 11, 27, 34, and 42–43 of Cabib et al. use the optical density analysis of Equation 6 of Cabib et al. to characterize and determine identities/properties of organisms.” (Non-Final Act. 8–9.) An “optical density analysis” is, however, recited in claims 42, which depends from claim 1, and claim 43, which depends from claim 1 and 42. Claim 11 depends from claim 1 and recites that the “sample is selected

from the group consisting of a cell, a tissue and an organism.” And, as Appellants point out, none of the claims expressly disclose a “identifying a microorganism.” (App. Br. 13.) In any event, the Examiner’s combinations still require picking and choosing various disclosures that are not directly related to one another and, thus, are insufficient to show anticipation.

In addition, the Examiner has not persuasively shown that Example 4 discloses the claim elements concerning “obtaining at least one multi-pixels image” of a sample microorganism and “identifying said microorganism by comparing . . . selected spectra with spectra of reference microorganisms.” Example 4 relates to fluorescence spectral imaging of various species of coral to identify localized concentrations of chlorophyll on the coral’s surface. (Cabib col. 48–52.) Although the concentrations of chlorophyll relate to presence of algae at those locations (*see, e.g.*, col. 51, l. 57 to col. 52, l. 19), there is nothing to expressly indicate that the algae is identified based on a comparison of its spectral characteristics with spectra of a reference microorganism from a database, such as in the manner claimed.

Example 1 of Cabib, which the Examiner cites in the Answer, is lacking for similar reasons. That example relates to tracking life processes (in particular algal digestion) in a paramecium. (Cabib col. 40–42.) This example relies on “similarity mapping highlighting the position in the cell of a specific chemical [here chlorophyll] or organelle.” (*Id.* at col. 40, ll. 66–67.) But, once again, even if the detection of chlorophyll correlates to the presence of algae in the paramecium’s digestive tract, Example 1 does not disclose that algae is identified based on a comparison of its spectral characteristics with reference spectra of microorganisms in a database.

For these reasons, we conclude the Examiner did not establish by a preponderance of the evidence that claim 1, or dependent claims 3, 4, 6–17, 19, and 20, are anticipated by Cabib.

*Obviousness – 35 U.S.C. § 103(a)*

The Examiner determined that dependent claim 5 would have been obvious over Cabib in view of Beattie, and determined that dependent claim 18 would have been obvious over Cabib in view of Lewis. The Examiner relies on Beattie and Lewis as teaching discrete elements of claims 5 and 18 respectively, and has not argued or persuasively shown that Beattie or Lewis address the deficiencies of Cabib discussed above in relation to the rejection under § 102. We thus conclude that the Examiner has not established by a preponderance of the evidence that claims 5 or 18 would have been obvious.

SUMMARY

We reverse the rejection: (i) of claims 1, and 3–19 under 35 U.S.C. § 101; (ii) of claims 1, 3, 4, 6–17, and 19–20 under 35 U.S.C. § 102(b) as anticipated by Cabib; (iii) of claim 5 under 35 U.S.C. § 103(a) as being unpatentable over Cabib in view of Beattie; and (iv) of claim 18 under 35 U.S.C. § 103(a) as being unpatentable over Cabib in view Lewis.

REVERSED