

ANALYZING THE PATENTABILITY OF
"INTANGIBLE" YET "PHYSICAL" SUBJECT MATTER

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INTRODUCTION

In this rapidly evolving age of technology, the difficulty of applying the law, which evolves at a glacial pace, to technology becomes apparent. This is especially so in the field of patents.

Since the infancy of this nation, courts have struggled with the issue of what is, or is not, patentable subject matter. As time

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and science move forward, the law struggles to keep pace while, at the same time, resisting change in order to maintain stability. This article traces the history of patentable subject matter in the United States, including the constitutional basis, statutory evolution, and court decisions interpreting the statutes. The historical evolution of patent law serves as a basis for analyzing the specific problem at hand: whether signals, which may be wholly represented by a mathematical equation, should be considered patentable subject matter under 35 U.S.C. § 101. In addressing this particular problem, it is the author's intent to extend the analyses to other subject matter that is "physical" yet "intangible." The significance of such a subject matter (*i.e.*, a physical entity that may wholly be a mathematical equation) arises in the context of modern patents wherein an entire system, or even an entire field of study, may be preempted if a mathematical equation is given monopoly protection.

In reviewing the patentability of signals, *per se*, greater attention will be paid to decisions dealing with machine, manufacture, or composition of matter (rather than process patents) since "signals" typically fall into the category of machine, manufacture, or composition of matter. However, in

order to examine the courts' reasoning, cases dealing with process patents will also be examined.²

While tracing the history of patentable subject matter, it is the author's intent to glean several unchanging legal principles from its history, such as the denial of patent protection for mere ideas. Moreover, it is the author's intent to address several legal principles that have been questioned or have been followed inconsistently by the courts, such as whether intangible material is within § 101 subject matter. It should be noted that the legal principles following each court decision reflect the condition of the law at that time in history, not the present.

After an analysis of the legal history with reference to patentable subject matter, the author will define what is a signal, as viewed from both the scientific community as well as the legal community. Thereafter, the issue of whether a signal, per se, constitutes patentable subject matter will be addressed.

² Gottschalk v. Benson, 409 U.S. 63, 67-68 (1972) (referring to Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127 (1948)) ("We dealt there with a 'product' claim, while the present case deals with a 'process' claim. But we think the same principle applies.").

Finally, the author will address the policy reasons for and against including signals, per se, as statutory subject matter under 35 U.S.C. § 101. Thereafter, a clearer method for analyzing the patentability of signals (and other "abstracts") will be proposed.

In brief, this approach suggests that §§ 112, 102, and 103, instead of §101, should be used to curtail patent scope. Commingling the § 101 analysis with the §§ 112, 102, and 103 analysis provides a less systematic approach. Thus, in analyzing whether or not a particular subject matter is within § 101, the subject matter analysis should be wholly separate from other questions related to patentability, such as enablement, novelty, or obviousness. A sample analysis for examining the scope of patent protection is provided wherein enablement, novelty, and obviousness restrictions are invoked to curtail the somewhat broad scope afforded by subject matter alone. The advantage of this approach is shown as compared to the artificial constraining of the scope of patentable subject matter.

THE CONSTITUTIONAL BASIS FOR PATENT LAW

Before examining cases dealing with patents, it is useful, at the outset, to examine the constitutional provision from which the patent laws originate. Article I of the United States Constitution provides:

The Congress shall have Power . . . To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries[.]³

It is worthwhile to note that, of all the powers granted to Congress in section 8 of Article I, the clause dealing with the "Progress of Science and useful Arts" is the only power in which Congress is given a specific means for carrying out the objective.⁴ The means for executing all other grants of congressional power are found in the "necessary and proper" clause of Article I, section 8.⁵

It is also worth noting that, while Article I, Section 8 seems to provide broad protection by securing exclusive rights to inventors, these rights are not without restrictions, e.g.,

³ U.S. Const. art. I, § 8, cl. 8.

⁴ *Id.* ("[B]y securing . . . to Authors and Inventors the exclusive Right to their respective Writings and Discoveries[.]").

⁵ U.S. Const. art. I, § 8, cl. 18.

limited duration and limited scope.⁶ As we will see, this point becomes important when studying cases dealing with patent laws because courts have struggled to maintain a balance between the inventor's exclusive rights and the potential retardation of scientific progress due to the inventor's monopoly over the invention.

Finally, while the language of the Constitution provides for the protection of "Discoveries" (not "inventions"), the protection extends to "Inventors" rather than "discoverers."⁷ Because of the Constitution's use of the word "Discoveries," rather than "inventions," earlier patent cases struggled to define the scope of what was (or could be) patentable subject matter.

HISTORY OF THE PATENT STATUTES

Although not all of the original Patent Act of 1790 deals with patentable subject matter, it is worthwhile to examine, at a minimum, the first paragraph of the statute and compare it with the constitutional text. The First Congress enacted the Patent

⁶ U.S. Const. art. I, § 8, cl. 8. (" . . . for limited Times . . .").

⁷ U.S. Const. art. I, § 8, cl. 8.

Act of 1790, which provided:

That upon the petition of any person or persons to the Secretary of State, the Secretary for the department of war, and the Attorney General of the United States, setting forth, that he, she, or they, hath or have invented or discovered any useful art, manufacture, engine, machine, or device, or any improvement therein not before known or used, and praying that a patent may be granted therefor, it shall and may be lawful to and for the said Secretary of State, the Secretary for the department of war, and the Attorney General, or any two of them, if they shall deem the invention or discovery sufficiently useful and important, to cause letters patent to be made out in the name of the United States, or to bear teste by the president of the United States, reciting the allegations and suggestions of the said petition, and describing the said invention or discovery, clearly, truly and fully, and thereupon granting to such petitioner or petitioners, his, her or their heirs, administrators or assigns for any term not exceeding fourteen years, the sole and exclusive right and liberty of making, constructing, using and vending to others to be use, the said invention or discovery[.]⁸

In the first instance, the constitutional subject of "Discoveries" is defined as "invention or discovery" and further specified as any "art, manufacture, engine, machine, or device, or any improvement therein[.]"⁹ Moreover, while the constitutional text does not deal with novelty or usefulness, the statutory text limits patentable subject matter to those things that are "sufficiently useful and important[,]" and "not

⁸ Act of April 10, 1790, ch. 7, § 1, 1 Stat. 109.

⁹ Act of April 10, 1790, ch. 7, § 1, 1 Stat. 109, 110.

before known or used[.]"¹⁰ Thus, it appears that Congress clarified, through statute, the scope of "Discoveries."¹¹ Also, Congress struck a balance between the inventor's exclusive monopoly and the public's deprivation of the subject matter by limiting "the sole and exclusive right" to a "term not exceeding fourteen years[.]"¹² Moreover, from the outset, Congress required that the inventor "clearly, truly and fully" describe the invention in order to obtain patent protection.¹³ Thus, the original Patent Act appeared to integrate novelty, usefulness, and importance into patentability analysis. It is, however, unclear whether the enumerated categories (i.e., "art, manufacture, engine, machine, or device") were designed as examples or limitations on patentable subject matter.

In 1793, Congress amended the Patent Act to read:

¹⁰ Act of April 10, 1790, ch. 7, § 1, 1 Stat. 109, 110.

¹¹ Although it is possible to interpret the statute as narrowing the constitutional scope, since both the Constitution and the original patent statute were penned by the same people, it is more reasonable to assume that the statute clarifies, rather than narrows, the constitutional mandate. See, e.g., *Diamond v. Chakrabarty*, 447 U.S. 303, 308 (1980) ("The Patent Act, . . . authored by Thomas Jefferson . . .").

¹² Act of April 10, 1790, ch. 7, § 1, 1 Stat. 109, 110.

¹³ Act of April 10, 1790, ch. 7, § 1, 1 Stat. 109, 110.

That when any person or persons, being a citizen or citizens of the United States, shall allege that he or they have discovered any new and useful art, machine, manufacture or composition of matter, or any new and useful improvement on any art, machine, manufacture or composition of matter, not known or used before the application, and shall present a petition to the Secretary of State, signifying a desire of obtaining an exclusive property in the same, and praying that a patent may be granted therefor, it shall and may be lawful for the said Secretary of State, to cause letters patent to be made out in the name of the United States, bearing teste by the President of the United States, reciting the allegations and suggestions of the said petition, and giving a short description of the said invention or discovery, and thereupon granting to such petitioner, or petitioners, his, her, or their heirs, administrators or assigns, for a term not exceeding fourteen years, the full and exclusive right and liberty of making constructing, using, and vending to others to be used, the said invention or discovery, which letters patent shall be delivered to the Attorney General of the United States, to be examined[.]¹⁴

The two most significant textual changes with respect to patentability were (1) the change in subject matter categories, and (2) the change in the disclosure requirement.¹⁵ In the subject matter categories, "art, manufacture, engine, machine, or device"¹⁶ was amended to "art, machine, manufacture or composition of matter[.]"¹⁷ It is unclear whether this amendment reduced the scope of patentable subject matter by reducing the

¹⁴ Act of February 21, 1793, ch. 11, § 1, 1 Stat. 318.

¹⁵ Act of February 21, 1793, ch. 11, § 1, 1 Stat. 318.

¹⁶ Act of April 10, 1790, ch. 7, § 1, 1 Stat. 109, 110.

categories of allowable subject matter, or whether the amendment merely collapsed duplicate categories and maintained the scope of patentable subject matter. The amendment also changed the disclosure requirement from "clearly, truly and fully"¹⁸ to "short description[.]"¹⁹ It seems unlikely that, despite the removal of "clearly, truly and fully[,]" Congress would allow patents for unclear, untrue, and incomplete disclosures.

The next amendment, made in 1800,²⁰ neither added nor subtracted significantly from the amendment of 1794.

The Patent Act was further amended in 1836 to read:

That any person or persons having discovered or invented any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement on any art, machine, manufacture, or composition of matter, not known or used by others before his or their discovery or invention thereof, and not, at the time of his application for a patent, in public use or on sale, with his consent or allowance, as the inventor or discoverer; and shall desire to obtain an exclusive property therein, may make application in writing to the Commissioner of Patents, expressing such desire, and the Commissioner, on

¹⁷ Act of February 21, 1793, ch. 11, § 1, 1 Stat. 318.

¹⁸ Act of April 10, 1790, ch. 7, § 1, 1 Stat. 109, 110.

¹⁹ Act of February 21, 1793, ch. 11, § 1, 1 Stat. 318.

²⁰ Act of April 17, 1800, § 1, 2 Stat. 37.

due proceedings had, may grant a patent therefor.²¹

While the wording of the statute changed, it appears that little changed with respect to patentable subject matter. The categories remained "art, machine, manufacture, or composition of matter[,]" and was still limited to "new and useful" subject matter.²²

Much of the language was simplified in 1870 to read:

That any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country, and not patented, or described in any printed publication in this or any foreign country, before his invention or discovery thereof, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the duty required by law, and other due proceedings had, obtain a patent therefor.²³

Despite several changes in the statute with respect to previously published material, not much changed in the way of the categories of patentable subject matter (i.e., "art, machine, manufacture, or composition of matter") or the novelty

²¹ Act of July 4, 1836, § 6, 5 Stat. 117, 119.

²² Act of July 4, 1836, § 6, 5 Stat. 117, 119.

²³ Act of July 8, 1870, ch. 230, § 24, 16 Stat. 198, 201.

and usefulness requirements (i.e., "new and useful").

This language remained virtually unchanged in subsequent amendments²⁴ and, in 1952, crystallized to the current patent statute, 35 U.S.C. § 101, which provides:

Whoever 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.²⁵

In an analysis of the patent statutes, it appears that, despite the textual evolution since 1790, not much has changed

²⁴ Act of March 3, 1897, ch. 391, § 1, 29 Stat. 692. ("Any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country, before his invention or discovery thereof, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, or more than two years prior to his application, and not in public use or on sale in this country for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the fees required by law, and other due proceedings had, obtain a patent therefor.");

35 U.S.C. § 31 (1948). ("Any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country, before his invention or discovery thereof, and not patented . . . may . . . obtain a patent therefor.").

²⁵ 35 U.S.C. § 101 (1952).

substantively in the text of the statute with reference to patentable subject matter. One thing that is unclear from the text itself is whether "process, machine, manufacture, or composition of matter" are merely examples of patentable subject matter, or whether these categories are limitations on patentable subject matter. Moreover, from a strict textual analysis, it seems that "new and useful" should play a role in analyzing patentable subject matter, since this is expressly mentioned in the text. This language, however, would subsequently cause some confusion in the courts.

THE COURTS' STRUGGLE WITH PATENTABLE SUBJECT MATTER

This section deals with the courts' struggle in defining what is, or is not, patentable subject matter.

Early Court Decisions

Since the passage of the patent laws, courts have struggled with the question of what is, or is not, protected as patentable subject matter under the statutes. As early as 1842, the Supreme Court faced the problem of defining what was within the

scope of the patent laws. In *Carver v. Hyde*,²⁶ the Supreme Court decided a patent infringement case involving an improvement in the use of cotton gins. In examining a "manner of forming the ribs of saw-gins, for the ginning of cotton[,]"²⁷ wherein the end result was a fastened rib on a cotton gin, the Court found that while the device that allowed for such a formation was patentable, the result that it produced (*i.e.*, the result of having a fastened rib) was not patentable. Thus, in ruling that the patent was valid but not infringed, the Court stated that while "the end to be accomplished is not the subject of a patent . . . [,] new and useful means for obtaining [that end]" were patentable.²⁸ Hence, the Court distinguished between the means and the end, the former being patentable while the latter, unpatentable,²⁹ and, thus, the "result of a machine"³⁰ doctrine

²⁶ *Carver v. Hyde*, 41 U.S. 513 (1842).

²⁷ *Id.*

²⁸ *Id.* at 519.

²⁹ Although products are currently patentable and may be seen as an "end" rather than a "means," at this point in the chronology, it is clear that the Supreme Court disallows patent protection on products if that product is merely the "end" of a process. See, e.g., *Le Roy v. Tatham*, 55 U.S. 156 (1852).

³⁰ "Result of a machine" doctrine stands for the proposition that, although a machine or process is patentable, the mere result of that machine or process is not patentable. Courts have, more recently, referred to this as the "function of a

was born.

Exactly a decade after *Carver*, the Supreme Court, in *Le Roy v. Tatham*,³¹ further expounded on the scope of patentable subject matter. In *Le Roy*, the Court examined a process in which "lead . . . under heat and pressure, in a closed vessel, would reunite perfectly after a separation of its parts[,]"³² was used to create lead pipes. In examining the claimed inventive process, the Court held that the leaden pipes themselves were not patentable subject matter as articles of manufactures because the pipes were merely the result of the claimed process. The Court held that "a principle is not patentable" because "in the abstract, [it] is a fundamental truth; an original cause; a motive" which "cannot be patented, as no one can claim in either of them an exclusive right."³³ The Court further reasoned that a patent on an effect or result would "prohibit all other persons from making the same thing by any means whatsoever[]" and that "[t]his, by creating monopolies, would discourage arts and

machine" doctrine.

³¹ *Le Roy v. Tatham*, 55 U.S. 156 (1852).

³² *Id.* at 157.

³³ *Id.*

manufactures, against the avowed policy of the patent laws."³⁴

In a well reasoned dissent, Justice Nelson, although agreeing that mere principles could not be patented,³⁵ stated that if a means for application to a useful end were disclosed, the inventor should be entitled to protection against all other modes of applying that principle.³⁶ Thus, despite the disagreement on the scope of protection, the "mere principles" doctrine³⁷ (i.e., that mere principles were not, and could not be, the subject of patents) was well established by this time.³⁸

³⁴ *Id.* at 175.

³⁵ *Id.* at 156 (Nelson, J., dissenting).

³⁶ *Id.* at 185 (Nelson, J., dissenting) ("This case is founded upon a doctrine which has been recognized in several subsequent cases in England, namely, that where a person discovers a principle or property of nature, or where he conceives of a new application of a well-known principle or property of nature, and also, of some mode of carrying it out into practice, so as to produce or attain a new and useful effect or result, he is entitled to protection against all other modes of carrying the same principle or property into practice for obtaining the same effect or result.").

³⁷ Although courts have not named this the "mere principle rule," the author, for purposes of abbreviation and ease of reference, uses this nomenclature.

³⁸ *See, e.g., O'Reilly v. Morse*, 56 U.S. 62, 114 (1853);

Rubber-Tip Pencil Co. v. Howard, 87 U.S. 498, 507 (1874);

Dolbear v. American Bell Tel. Co., 126 U.S. 1, 532 (1888);

In addition to affirming the "mere principles" doctrine, the Court seemed to suggest that the basis for the "result of a machine" doctrine was the "mere principles" doctrine (i.e., the

Hazeltine Corp. v. Electric Service Engineering Corp., 18 F.2d 662, 665 (S.D.N.Y. 1926);

MacKay Radio & Telegraph Co., Inc. v. Radio Corp. of America, 306 U.S. 86 (1939);

Katz v. Horni Signal Mfg. Corp., 145 F.2d 961 (2nd Cir. 1944);

Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1948);

In re Bernhart, 417 F.2d 1395 (C.C.P.A. 1969);

Gottschalk v. Benson, 409 U.S. 63, 67 (1972);

In re Castelet, 562 F.2d 1236, 1241 (C.C.P.A. 1977);

Parker v. Flook, 437 U.S. 584, 589 (1978);

In re Walter, 618 F.2d 758, 765 (C.C.P.A. 1980);

Diamond v. Chakrabarty, 447 U.S. 303, 309 (1980);

Diamond v. Diehr, 450 U.S. 175, 185 (1981);

In re Taner, 681 F.2d 787, 789 (C.C.P.A. 1982);

In re Meyer, 688 F.2d 789, 795 (C.C.P.A. 1982);

Arrhythmia Research Technology, Inc. v. Corazonix Corp., 958 F.2d 1053, 1056 (Fed. Cir. 1992);

In re Alappat, 33 F.3d 1526, 1542 (Fed. Cir. 1994);

In re Warmerdam, 33 F.3d 1354, 1358 (Fed. Cir. 1994);

In re Trovato, 42 F.3d 1376, 1381 (Fed. Cir. 1994);

State Street Bank & Trust Co. v. Signature Financial Group, Inc., 149 F.3d 1368, 1373 (Fed. Cir. 1998).

result of a machine is merely a principle of nature). While the Court has subsequently used the "mere principles" doctrine and the "result of a machine" doctrine interchangeably,³⁹ it is unclear whether these two doctrines are truly interchangeable.

The Court revisited the question of whether a mere principle, such as a law of nature, could be patentable subject matter in *O'Reilly v. Morse*.⁴⁰ This issue resurfaced in the context of the telegraph. By providing a new and useful means for applying electromagnetism, the telegraph raised the question of whether a law of nature, which is unpatentable subject matter, could become patentable subject matter when bootstrapped to a patentable process.

The dissent submitted that while the "mere discovery of a new element, or law, or principle of nature, without any valuable application of it to the arts, is not the subject of a

³⁹ *O'Reilly v. Morse*, 56 U.S. 62,268 (1853) ("It is for the discovery or invention of some practicable method or means of producing a beneficial result or effect, that a patent is granted, and not for the result or effect itself.");

Id. ("But it is well settled that a man cannot have a patent for the function or abstract effect of a machine, but only for the machine which produces it.").

⁴⁰ *O'Reilly v. Morse*, 56 U.S. 62 (1853).

patent[,]"⁴¹ if this "element" could be made "the servant of man" and applied to the perfecting of a new and useful art, it should be patentable subject matter.⁴² Thus, the dissent seemed to say that a law of nature, if made practical and useful by incorporating it into a practically useful machine, could become patentable subject matter.

The majority, on the other hand, separated the law of nature from the machine that made practical use of the law of nature, and characterized Morse's patent to claim an "effect produced by the use of electromagnetism distinct from the process or machinery used necessary to produce it."⁴³ Thus, that portion of the patent claiming exclusive use of the electromotive force was overbroad because it claimed a mere principle and, hence, unpatentable "because the discovery of a principle in natural

⁴¹ *O'Reilly*, 56 U.S. at 133 (Wayne, Nelson, and Grier, JJ., dissenting).

⁴² *Id.* (Wayne, Nelson, and Grier, JJ., dissenting) ("The mere discovery of a new element, or law, or principle of nature, without any valuable application of it to the arts, is not the subject of a patent. But he who takes this new element or power, as yet useless, from the laboratory of the philosopher, and makes it the servant of man; who applies it to the perfecting of a new and useful art, or to the improvement of one already known, is the benefactor to whom the patent law tenders its protection.").

⁴³ *Id.* at 120.

philosophy or physical science, is not patentable."⁴⁴ The Court, therefore, seemed to be invalidating the patent as being overbroad, rather than as containing unpatentable subject matter. The issue of characterizing what an inventor claims to have invented (or discovered) has subsequently plagued the courts, because validation of patents have depended on the characterization of whether the patent is a process or principle.⁴⁵ Regardless of problems with characterization,

⁴⁴ *Id.* at 116.

⁴⁵ *See, e.g., Rubber-Tip Pencil Co. v. Howard*, 87 U.S. 498, 505 (1874);

Dolbear v. American Bell Tel. Co., 126 U.S. 1 (1888);

Knapp v. Morss, 150 U.S. 221 (1893);

American Fruit Growers, Inc. v. Brogdex Co., 283 U.S. 1 (1931);

Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127 (1948);

In re Tarczy-Hornoch, 397 F.2d 856 (C.C.P.A. 1968);

Gottschalk v. Benson, 409 U.S. 63 (1972);

In re Castelet, 562 F.2d 1236 (C.C.P.A. 1977);

Parker v. Flook, 437 U.S. 584, 586 (1978);

Diamond v. Chakrabarty, 447 U.S. 303 (1980);

Diamond v. Diehr, 450 U.S. 175, 192-193 (1981);

In re Abele, 684 F.2d 902, 907 (C.C.P.A. 1982);

Arrhythmia Research Technology, Inc. v. Corazonix Corp., 958 F.2d 1053, 1057 (Fed. Cir. 1992);

courts have consistently held that the first step in patent analysis is determining what the inventor claims to have invented or discovered (i.e., characterizing the invention).⁴⁶

O'Reilly was subsequently clarified in *Dolbear v. American Bell Tel. Co.*⁴⁷ (the Telephone Case). In *Dolbear*, the Supreme Court definitively addressed the issue of whether electricity could be patentable subject matter.⁴⁸ In holding that electricity could be patentable subject matter, the Court stated that unlike Morse, who claimed magnetism as a motive power without regard to process,⁴⁹ Bell's "art consist[ed] in controlling the force as to make it accomplish the purpose."⁵⁰ Hence, the Court seemed to agree with the dissent in *O'Reilly*, that "he who takes this new

In re Alappat, 33 F.3d 1526, 1544 (Fed. Cir. 1994);

In re Trovato, 42 F.3d 1376, 1383 (Fed. Cir. 1994).

⁴⁶ *Rubber-Tip Pencil Co. v. Howard*, 87 U.S. at 505 (1874).

⁴⁷ *Dolbear v. American Bell Tel. Co.*, 126 U.S. 1 (1888).

⁴⁸ *Id.* at 534 ("In the present case the claim is not for the use of a current of electricity in its natural state as it comes from the battery, but for putting a continuous current, in a closed circuit, into a certain specified condition, suited to the transmission of vocal and other sounds, and using it in that condition for that purpose.").

⁴⁹ *Id.* at 534.

⁵⁰ *Id.* at 532.

element or power, as yet useless, from the laboratory of the philosopher, and makes it the servant of man; who applies it to the perfecting of a new and useful art, or to the improvement of one already known, is the benefactor to whom the patent law tenders its protection."⁵¹ Several questions remained open after *Dolbear*. For example, was any change sufficient to make a law of nature patentable, or did there have to be a certain threshold quantum of change? How much of a change was required to meet the minimum threshold? Can naturally occurring devices or processes (e.g., sticks, stones, water, vacuum, signals, etc.) be patentable as long as they can be "made a servant to man?" Is practical utility now the benchmark of patentable subject matter? Many of these questions were answered in a trilogy of Supreme Court decisions: *American Fruit Growers, Inc. v. Brogdex Co.*,⁵² *Funk Bros. Seed Co. v. Kalo Inoculant Co.*,⁵³ and *Greater Atlantic & Pacific Tea Co. v. Supermarket Equipment*

⁵¹ *O'Reilly*, 56 U.S. at 133 (Wayne, Nelson, and Grier, JJ., dissenting).

⁵² *American Fruit Growers, Inc. v. Brogdex Co.*, 283 U.S. 1 (1931).

⁵³ *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127 (1948).

Corp.⁵⁴

In *American Fruit Growers, Inc.*, the Supreme Court seemed to suggest that patentability did depend on the quantum of change.⁵⁵ The Circuit Court of Appeals had held that a process of treating fruit with borax to prevent mold growth was patentable because the product was "a combination of the natural fruit and a boric compound" and the "complete article is not found in nature . . ."⁵⁶ The Supreme Court reversed, holding that something more than mere change was necessary to convert unpatentable subject matter into patentable subject matter.⁵⁷ The Court reasoned as follows:

Addition of borax to the rind of natural fruit does not produce from the raw material an article for use which possesses a new or distinctive form, quality, or property. The added substance only protects the natural article against deterioration by inhibiting development of extraneous spores upon the rind. There is no change in the name, appearance, or general character of the fruit. It

⁵⁴ *Greater Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147 (1951).

⁵⁵ *American Fruit Growers*, 283 U.S. at 11-12.

⁵⁶ *Id.* at 11 (citing lower court decision).

⁵⁷ *Id.* at 12-13 (internal quotes omitted) ("Manufacture implies a change, but every change is not manufacture, and yet every change in an article is the result of treatment, labor, and manipulation. But something more is necessary . . .").

remains a fresh orange, fit only for the same beneficial uses as theretofore.⁵⁸

The Court, therefore, seemed to pronounce the rule that, at a minimum, to have patentable subject matter, there needed to be a transformation, and the minimum threshold for transformation was a change in form, quality, property, name, appearance, character, or use.⁵⁹

American Fruit Growers is confusing because there appeared to be a change in the property of the fruit (i.e., a change in the decay-resistant property of the fruit),⁶⁰ yet the Court held the borax-treated fruit to be nonstatutory subject matter. Thus, in deciding that a sufficient change is necessary to transform nonstatutory subject matter into statutory subject matter, the Court left open the question of what is sufficient change. Also, since the borax treated fruit seemed to have practical utility, by holding the fruit to be nonstatutory subject matter, the Court held that practical utility, standing alone, was insufficient to satisfy the statutory requirement.

⁵⁸ *Id.* at 11-12.

⁵⁹ *Id.* at 11-13.

⁶⁰ *Id.* at 11 (citing lower court decision).

In an effectively defunct case,⁶¹ the Supreme Court, in *Funk Bros. Seed Co. v. Kalo Inoculant Co.*,⁶² affirmed its decision in *American Fruit Growers*. In *Funk Bros.*, the inventor, Bond, had discovered certain traits associated with several strains of bacteria, and combined particular strains to produce an inoculant for leguminous plants.⁶³ The Court reasoned that the aggregation was nothing more than "an application of [a] newly-discovered natural principle[,]"⁶⁴ and that although the combination "may have been the product of skill, it certainly was not the product of invention."⁶⁵ Thus, by characterizing the combination of bacteria as a "law of nature" or "work of nature," the Court found the inventor's mixed bag of inoculants to be nonstatutory subject matter.

Justice Frankfurter, while concurring in the judgment, criticized the majority because, in Frankfurter's opinion,

⁶¹ See, e.g., *Diamond v. Chakrabarty*, 447 U.S. 303 (1980) (effectively curtailing the holding of *Funk Bros.* by distinguishing Chakrabarty's subject matter).

⁶² *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127 (1948).

⁶³ *Funk Bros.*, 333 U.S. at 131.

⁶⁴ *Id.*

⁶⁵ *Id.*

everything exemplified a law of nature, and the Court's arguments could be used to challenge almost any combination patent.⁶⁶ Moreover, because "[m]ulti-purpose tools, multivalent vaccines, vitamin complex composites . . . whose sole new property is the conjunction of the properties of their components" would, according to the Court's standard, surely be nonstatutory subject matter, it was unclear whether any combination patent could survive the Court's standard. Indeed, if the standard, as stated time and time again, was the "application of the law of nature to a new and useful end[,]"⁶⁷

⁶⁶ *Id.* at 134 ("It only confuses the issue, however, to introduce such terms as 'the work of nature' and the 'laws of nature.' For these are vague and malleable terms infected with too much ambiguity and equivocation. Everything that happens may be deemed 'the work of nature,' and any patent composite exemplifies in its properties 'the law of nature.'").

⁶⁷ *Le Roy v. Tatham*, 55 U.S. at 156;

Corning v. Burden, 56 U.S. at 268;

O'Reilly, 56 U.S. at 133 (Wayne, Nelson, and Grier, JJ., dissenting);

Dolbear v. American Bell Tel. Co., 126 U.S. at 534;

National Hollow Brake-Beam Co. v. Interchangeable Brake-Beam Co., 106 F. 693, 708 (8th Cir. 1901);

Hazeltine Corp. v. Electric Service Engineering Corp., 18 F.2d 662, 665 (S.D.N.Y. 1926);

MacKay Radio & Telegraph Co., Inc. v. Radio Corp. of America, 306 U.S. 86 (1939);

then wasn't the combining of strains of bacteria having non-inhibitive properties (i.e., the application of the law of nature) within that definition?

The Court addressed this concern (i.e., the standard for combination patents)⁶⁸ in *Greater Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp.*⁶⁹ In holding a bottomless counter guide unpatentable, the Court stated that combination patents should be examined under a heightened scrutiny "with a care proportional to the difficulty and improbability of finding invention in an assembly of old elements."⁷⁰ The patent in question involved a "mere elongation of a merchant's counter[,]"⁷¹ which the Court considered as a combination patent.

Funk Bros., 333 U.S. at 130.

⁶⁸ It is unclear from the case whether the Court is dealing with "statutory subject matter," which is currently governed by 35 U.S.C. § 101, or "novelty" and "obviousness," which are currently governed by 35 U.S.C. §§ 102 and 103, respectively. The analysis, however, seems to parallel the analysis from *Rubber-Tip Pencil Co. v. Howard*, 87 U.S. 498 (1874). Thus, the author views *Greater Atlantic & Pacific Tea Co.* as if the Court's objection here is "statutory subject matter," and not "novelty" or "obviousness."

⁶⁹ *Greater Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147 (1951).

⁷⁰ *Id.* at 152.

⁷¹ *Id.* at 150.

The policy underlying this was that a "grant of monopoly for every trifling device" would obstruct invention and, hence, would be contrary to the constitutional purpose.⁷² Thus, in order to sustain a combination patent, the conjunction or concert, as a whole, must contribute something more than the sum of its parts.⁷³ Moreover, the combination patent may not "subtract from former resources freely available to skilled artisans."⁷⁴ The Court, in defining the proper standard applicable to patentable subject matter for combination patents, further held that something "more than ordinary mechanical skill" was necessary⁷⁵ and that "it ha[d] to be of such quality and distinction that masters of the scientific field in which it falls will recognize it as an advance."⁷⁶ Thus, the Court seemed to be combining novelty and obviousness into a subject matter analysis.⁷⁷ The Court also noted that, while finding invention in mechanical combination patents is unlikely, in chemistry and

⁷² *Id.* at 155 (Douglas and Black, JJ., concurring).

⁷³ *Id.* at 152.

⁷⁴ *Id.*

⁷⁵ *Id.* at 151 n.6.

⁷⁶ *Id.* at 155 (Douglas and Black, JJ., concurring).

⁷⁷ "Patentable subject matter" analysis currently falls under 35 U.S.C. § 101 while "novelty" and "obviousness" analysis

electronics, invention may result from the mere combination of elements.⁷⁸ Thus, it seemed that different standards would apply to mechanical, as compared to chemical or electrical, patents.

Despite the Supreme Court's analysis in *Greater Atlantic & Pacific Tea Co.*, which seemed to import novelty and obviousness into subject matter analysis, the Court of Customs and Patent Appeals (CCPA) continued to analyze subject matter separately from novelty or obviousness.⁷⁹

The court decisions prior to 1970, therefore, established the rule that a "function of a machine" could not be patented. However, it was still unclear, in the continuum of subject matter, where an unpatentable "function" ended and a patentable "process" for achieving that function began. Moreover, although

currently falls under 35 U.S.C. §§ 102 and 103, respectively.

⁷⁸ *Greater Atlantic & Pacific Tea Co.*, 340 U.S. at 152 (1951) ("Elements may, of course, especially in chemistry or electronics, take on some new quality or function from being brought into concert, but this is not a usual result of uniting elements old in mechanics.").

⁷⁹ *In re Musgrave*, 431 F.2d 882, 889 (C.C.P.A. 1970) ("It should be apparent, however, that novelty and advancement of an art are irrelevant to a determination of whether the nature of a process is such that it is encompassed by the meaning of 'process' in 35 U.S.C. § 101.").

the "mere principles" doctrine (i.e., that laws of nature, scientific principles, and abstract ideas are not patentable) was well established, the quantum of "transformation" necessary to convert "mere principles" to patentable subject matter was still unclear. Further questions lingered. For example, was practical means of embodying a principle enough to impart patentability to otherwise unpatentable subject matter (i.e., was practical utility now the standard for patentable subject matter)? Was a heightened scrutiny applied to mechanical patents? Was novelty and obviousness a part of the analysis to determine patentable subject matter? As courts attempted to answer these questions, the line between patentable subject matter and unpatentable principles became increasingly blurred. To complicate matters further, the advent of the modern era of technology⁸⁰ placed these questions in a new context: software. Courts would continue their attempts to answer several of these questions in relation to computer-related technology. However, these decisions would result in apparent inconsistencies.

⁸⁰ Although it is arguable that every time period in history could be seen as some sort of technological era, the advent of computers (i.e., the University of Michigan's ENIAC and the University of Pennsylvania's MANIAC) in the late 1960's began a technological boom, which the author sees as a new era of technology. Thus, for purposes of this paper, post-1970 years will be referred to as the modern era of technology.

More Recent Court Decisions

As patents relating to computers and telecommunications became increasingly prevalent, the courts struggled to apply well-settled principles in patent law to these new areas of technology.

The CCPA, in *In re Tarczy-Hornoch*,⁸¹ upheld a patent for an apparatus and a method for sorting pulses. The patent disclosed method steps that would inherently carry out the function of the apparatus.⁸² Thus, the CCPA was faced with the question of whether or not the method steps were merely "functions of [the] machine." The CCPA held that, although every process could be seen as a function,⁸³ only "mere effects masquerading as processes" would be rejected under the "function of a machine" doctrine.⁸⁴ Thus, if the claims "delineated a means and not a

⁸¹ *In re Tarczy-Hornoch*, 397 F.2d 856 (C.C.P.A. 1968).

⁸² *Id.* at 857.

⁸³ *Id.* at 859 ("It is clear that some processes were thought patentable and others not. It is also clear that 'function of a machine' was symbolic of the latter.").

⁸⁴ *Id.* at 860, referring to *Chochrane v. Deener*, 94 U.S. 780 (1876) ("This discussion as well as the validation itself of the Flour-sifting process seemed to show that the connotation of the 'function of a machine' rejection was not an objection to mechanical processes but rather to mere effects masquerading as

result, the inventor would not be penalized for having invented the only means for effecting the result."⁸⁵ Essentially, the CCPA seemed to be reiterating the well-settled principle that "the end to be accomplished is not the subject of a patent" but the "invention consists in the new and useful means of obtaining it."⁸⁶

In *In re Bernhart*,⁸⁷ the CCPA upheld a patent for a method and apparatus for automatically making two-dimensional portrayals of three-dimensional objects. In reaching its conclusion, the CCPA began with the proposition that "all machines function according to laws of physics which can be mathematically set forth if known."⁸⁸ Thus, regardless of whether or not the mathematical algorithm (i.e., the law of nature) could be patented, the machine embodying the principle could be patented.⁸⁹ In

processes.").

⁸⁵ *Id.*

⁸⁶ *Carver v. Hyde*, 41 U.S. 513, 519 (C.C.P.A. 1842).

⁸⁷ *In re Bernhart*, 417 F.2d 1395 (C.C.P.A. 1969).

⁸⁸ *Id.* at 1399.

⁸⁹ *Id.* at 1400 ("To this question we say that if a machine is programmed in a certain new and unobvious way, it is physically different from the machine without that program; its memory elements are differently arranged. The fact that these physical changes are invisible to the eye should not tempt us to conclude

analyzing the claims, the CCPA seemed to harmonize many of the principles established in preceding cases. First, by approving patents for computers embodying mathematical algorithms, the CCPA affirmed the principle that a practical application of a law of nature could be patented. Moreover, even if nothing more than "mere skill" were necessary to program the mathematical algorithm into a computer, computer related inventions would not be subject to the heightened scrutiny of mechanical inventions.⁹⁰ Thus, the scope of patentable subject matter was, at least for computer related inventions, viewed broadly by the CCPA.

In *In re Musgrave*,⁹¹ the CCPA affirmed, if not broadened, the scope of patentable subject matter. In upholding a process for correcting seismic data as patentable, the CCPA noted that novelty was irrelevant in the determination of patentable

that the machine has not been changed. If a new machine has not been invented, certainly a 'new and useful improvement' of the unprogrammed machine has been, and Congress has said in 35 U.S.C. § 101 that such improvements are statutory subject matter for a patent.").

⁹⁰ See, e.g., *American Fruit Growers, Inc. v. Brogdex Co.*, 283 U.S. 1 (1931);

Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127 (1948);

Greater Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp., 340 U.S. 147 (1951).

⁹¹ *In re Musgrave*, 431 F.2d 882 (C.C.P.A. 1970).

subject matter.⁹² Moreover, the CCPA held that "it was a misconception to assume that 'all processes, to be patentable' must operate physically upon substances[,]"⁹³ and all that was needed was for patentable subject matter was that the patent be "in the technological arts so as to be in consonance with the Constitutional purpose to promote the progress of 'useful arts.'"⁹⁴ This standard, being in the "technological arts," for defining patentable subject matter was subsequently affirmed in *In re Foster*.⁹⁵

Thus, the CCPA seemed to reject the analysis in *Greater Atlantic & Pacific Tea Co.*,⁹⁶ which incorporated novelty into a determination of patentable subject matter. Moreover, the CCPA seemed to establish a new "technological arts" standard for determining patentable subject matter, thus, broadening the scope of patentable subject matter to encompass almost anything.

⁹² *Id.* at 889.

⁹³ *Id.* at 893.

⁹⁴ *Id.* at 893.

⁹⁵ *In re Foster*, 438 F.2d 1011 (1971).

⁹⁶ *Greater Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147 (1951).

The Supreme Court, however, significantly curtailed the scope of patentable subject matter in *Gottschalk v. Benson*.⁹⁷ In invalidating a method patent for converting binary-coded decimal numbers to pure binary numbers as being nothing more than a patent on a mathematical algorithm, the Court reiterated the policy from *O'Reilly*,⁹⁸ that the public must not be deprived of the laws of nature.⁹⁹ The Court reasoned that, since algorithms (i.e., laws of nature) were not directly patentable because it would deprive the public of "[a] basic tool[] of scientific and technological work[,] "¹⁰⁰ indirect patenting of algorithms should be disallowed since indirect patenting of algorithms would also

⁹⁷ *Gottschalk v. Benson*, 409 U.S. 63 (1972).

⁹⁸ *O'Reilly*, 56 U.S. 62 (1853).

⁹⁹ *Benson*, 409 U.S. at 68 (1972) (referring to the Morse telegraph) ("The Court in disallowing that claim said, 'If this claim can be maintained, it matters not by what process or machinery the result is accomplished. For aught that we now know, some future inventor, in the onward march of science, may discover a mode of writing or printing at a distance by means of the electric or galvanic current, without using any part of the process or combination set forth in the plaintiff's specification. His invention may be less complicated--less liable to get out of order-- less expensive in construction, and in its operation. But yet, if it is covered by this patent, the inventor could not use it, nor the public have benefit of it, without the permission of the patentee.'").

¹⁰⁰ *Id.* at 67.

defeat this policy.¹⁰¹ Thus, the Supreme Court seemed to apply the same analysis to *Benson* (i.e., mere programming of an algorithm into a computer is insufficient to confer statutory status to nonstatutory subject matter) as it did to *Greater Atlantic & Pacific Tea Co.* (i.e., mere skill was insufficient to transform unpatentable subject matter into patentable subject matter). The CCPA, however, continued to resist narrowing the scope of patentable subject matter and, instead, narrowed the holding of *Benson* in subsequent cases.

In *In re Castelet*,¹⁰² the CCPA, although ruling that a method for generating a family of curves on a computer was unpatentable, held that *Benson* only applied if the method or apparatus

¹⁰¹ *Id.* at 71-72 ("But in practical effect that would be the result if the formula for converting BCD numerals to pure binary numerals were patented in this case. The mathematical formula involved here has no substantial practical application except in connection with a digital computer, which means that if the judgment below is affirmed, the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself.");

Id. at 72 ("Direct attempts to patent programs have been rejected on the ground of nonstatutory subject matter. Indirect attempts to obtain patents and avoid the rejection, by drafting claims as a process, or a machine or components thereof programmed in a given manner, rather than as a program itself, have confused the issue further and should not be permitted.").

¹⁰² *In re Castelet*, 562 F.2d 1236 (C.C.P.A. 1977).

preempted all practical use of both the underlying mathematical formula and the involved algorithm.¹⁰³ The CCPA bolstered its decision in *Castelet* in *In re Freeman*.¹⁰⁴ In *Freeman*, the CCPA upheld a patent for typesetting characters as patentable because the claims neither recited nor preempted a mathematical algorithm. In holding so, the CCPA created a two-step test for determining whether *Benson* applied:

First, it must be determined whether the claim directly or indirectly recites an "algorithm" in the *Benson* sense of that term, for a claim which fails even to recite an algorithm clearly cannot wholly preempt an algorithm. Second, the claim must be further analyzed to ascertain whether in its entirety it wholly preempts that algorithm.¹⁰⁵

Thus, despite *Benson*, the CCPA continued to allow computer related patents, even though the patentable invention could be the mere programming of a computer to embody an algorithm.

¹⁰³ *Id.* at 1241 ("The Supreme Court felt that "*Benson's* claims would have preempted all practical use of both the underlying mathematical formula and the involved algorithm."");

Id. ("Because operation of a formula-solving computer constituted the only practical use of the involved algorithm, however, the Supreme Court deemed unpatentable what it considered claims to an algorithm performed in a computer, i.e., claims to the algorithm itself.").

¹⁰⁴ *In re Freeman*, 573 F.2d 1237 (C.C.P.A. 1978).

¹⁰⁵ *Id.* at 1245.

The Supreme Court, in *Parker v. Flook*,¹⁰⁶ addressed the issue of whether a useful post-solution application of a formula (*i.e.*, a mere application of a solved mathematical formula) would be sufficient to confer statutory status to an otherwise nonstatutory subject matter.¹⁰⁷ In rejecting a practically useful method for updating an alarm limit, the Court held that, while "[t]he line between patentable "process" and unpatentable "principle" is not always clear[,] "¹⁰⁸ allowing patentability of an obvious post-solution activity would exalt form over substance.¹⁰⁹ In reaching this conclusion, the Court stated:

Such 'mere' recognition of a theretofore existing phenomenon or relationship carries with it no rights to exclude others from enjoyment Patentable subject matter must be new (novel); not merely heretofore unknown. There is a very compelling reason for this rule. The reason is founded upon the proposition that in granting patent rights, the public must not be deprived of any rights that it theretofore freely enjoyed.¹¹⁰

Thus, the Court, in no uncertain terms, held that determining novelty was an integral part of determining patentable subject

¹⁰⁶ *Parker v. Flook*, 437 U.S. 584 (1978).

¹⁰⁷ *Id.* at 585.

¹⁰⁸ *Id.* at 589.

¹⁰⁹ *Id.* at 590.

¹¹⁰ *Id.* at 593 n.15.

matter. Moreover, the Court expanded its decision in *Benson*, that mere skill was insufficient to transform unpatentable subject matter into patentable subject matter, by holding that obvious post-solution activities were insufficient to confer statutory status to nonstatutory processes.

The dissent harshly criticized the majority for importing novelty and inventiveness into a subject matter analysis.¹¹¹ Moreover, according to the dissent, the majority mischaracterized Flook's claimed invention and, hence, erroneously analyzed the invention to find nonstatutory subject matter.¹¹²

In addition to the dissent's criticism, the validity of considering the "debilitating effect" on the patent office brought by "thousands of additional patent applications"¹¹³ is

¹¹¹ *Id.* at 600 (Stewart, J., dissenting) ("The Court today says it does not turn its back on these well-settled precedents . . . , but it strikes what seems to me an equally damaging blow at basic principles of patent law by importing into its inquiry under 35 U.S.C. § 101 the criteria of novelty and inventiveness. Section 101 is concerned only with subject-matter patentability.").

¹¹² *Id.* at 599 (Stewart, Rehnquist, JJ., and Burger, C. J., dissenting).

¹¹³ *Id.* at 587-588.

questionable. Taking the Court's reasoning to an extreme, it is possible to conclude that any new technology, which adds "thousands of additional patent applications," should be held nonstatutory in order to avoid inconveniencing the Commissioner of Patents and Trademarks. If, however, a new field of technology does emerge, then it goes without saying that "thousands of additional patent applications" would be filed in relation to that new field. Thus, to disallow patents because of inconvenience to the Patent and Trademark Office (PTO) would effectively foreclose patent protection for any new field of science or technology, thereby defeating the constitutional purpose of promoting the progress of science and the useful arts.

In any case, *Flook* seemed conclusively to incorporate novelty and inventiveness into patentable subject matter analysis.

Regardless of the Supreme Court decisions in *Benson* and *Flook*, the CCPA continued to ignore novelty and inventiveness in analyzing patentable subject matter. The CCPA, in subsequent decisions, further narrowed the holdings of *Benson* and *Flook*, and continued to follow the precedent of *Freeman*, allowing

indirect patenting of algorithms. In *In re Sherwood*,¹¹⁴ the CCPA, rejected the notion that novelty played any role in subject matter analysis, holding that a system and method for converting time signals into depth signals was patentable.¹¹⁵ Moreover, the CCPA, by characterizing Sherwood's invention as a real conversion (i.e., "convert[ing] one physical thing into another physical thing")¹¹⁶ rather than a mathematical conversion (e.g., binary-coded decimal to decimal), placed Sherwood's invention in a category separate from that of *American Fruit Growers*,¹¹⁷ *Funk Bros.*,¹¹⁸ *Greater Atlantic & Pacific Co.*,¹¹⁹ *Benson*,¹²⁰ and *Flook*.¹²¹ However, in characterizing Sherwood's invention in this manner, it seemed that the CCPA was exalting

¹¹⁴ *In re Sherwood*, 613 F.2d 809 (C.C.P.A. 1980).

¹¹⁵ *Id.* at 818 (quoting *In re Diehr*, 602 F.2d 982, 988 (C.C.P.A. 1979) "[t]he novelty . . . of any element or even of all the elements or steps, or of the combination has no bearing on whether the process is encompassed by § 101.").

¹¹⁶ *Id.* at 819.

¹¹⁷ *American Fruit Growers, Inc. v. Brogdex Co.*, 283 U.S. 1 (1931).

¹¹⁸ *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127 (1948).

¹¹⁹ *Greater Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147 (1950).

¹²⁰ *Gottschalk v. Benson*, 409 U.S. 63 (1972).

¹²¹ *Parker v. Flook*, 437 U.S. 584 (1978).

form over substance because such an analysis would make the same subject matter patentable if characterized as a "real conversion" while unpatentable if characterized differently.

In *In re Walter*,¹²² the CCPA found a seismic prospecting system unpatentable as merely claiming a mathematical algorithm. In holding so, the CCPA distinguished *Walter* from *Sherwood* by characterizing *Walter*'s seismic data as a mere number¹²³ while characterizing *Sherwood*'s seismic data as a "physical thing . . . represented in numerical form."¹²⁴ Moreover, the court held that "mere recordation . . . on some medium" was not sufficient to confer statutory status to what would otherwise be nonstatutory.¹²⁵ However, by characterizing *Sherwood*'s seismic data as a "physical thing," it seemed that, if the draftsman could portray a mere number as a physical thing represented in numerical form,¹²⁶ a patent would issue. Hence, even though mere

¹²² *In re Walter*, 618 F.2d 758 (C.C.P.A. 1980).

¹²³ *Id.* at 769-770.

¹²⁴ *Sherwood*, 613 F.2d at 819.

¹²⁵ *Walter*, 618 F.2d at 770 ("If § 101 could be satisfied by the mere recordation of the results of a nonstatutory process on some record medium, even the most unskilled patent draftsman could provide for such a step, thus converting a nonstatutory process to a statutory one with relative ease.").

¹²⁶ *Sherwood*, 613 F.2d at 819 (The court, referring to signals,

recordation on some medium would be insufficient to confer statutory subject matter, mere characterization would be sufficient as long as the characterization involved a "physical thing."

It seemed, therefore, that despite the Supreme Court's guidance on the issue (e.g., novelty plays a role in the determination of subject matter, mere skill is insufficient to confer statutory status to nonstatutory subject matter, exalting form over substance is impermissible, etc.), the CCPA continued to expand the scope of patentable subject matter.

In *Diamond v. Chakrabarty*¹²⁷ and *Diamond v. Diehr*,¹²⁸ the Supreme Court made a surprising turnaround from its prior decisions. Without explicitly overruling previous decisions, the Supreme Court adopted the CCPA's expansive scope of patentable subject matter. In *Chakrabarty*, the Court held that a new strain of bacteria, which was not naturally occurring, was patentable

stated that "[t]he claimed invention, contrary to the solicitor's arguments, converts one physical thing into another physical thing just as any other electrical circuitry would do.")

¹²⁷ *Diamond v. Chakrabarty*, 447 U.S. 303 (1980).

¹²⁸ *Diamond v. Diehr*, 450 U.S. 175 (1981).

subject matter. The Court examined the language and history of 35 U.S.C. § 101 and concluded that Congress intended to "include anything under the sun that is made by man."¹²⁹

In *Diehr*, the Court held that a process for curing synthetic rubber was patentable because the mathematical algorithm was merely used in an otherwise patentable process for curing rubber. The Court reiterated that the scope of patentable subject matter included "anything under the sun that is made by man."¹³⁰ Moreover, the Court, without explicitly overruling previous decisions, explicitly severed novelty analysis from patentable subject matter analysis.¹³¹

In a harsh and lengthy dissent, Justice Stevens, retracing the history of patent decisions, chided the majority for allowing

¹²⁹ *Chakrabarty*, 447 U.S. at 309.

¹³⁰ *Diehr*, 450 U.S. at 182.

¹³¹ *Id.* at 188-189 ("This is particularly true in a process claim because a new combination of steps in a process may be patentable even though all the constituents of the combination were well known and in common use before the combination was made. The "novelty" of any element or steps in a process, or even of the process itself, is of no relevance in determining whether the subject matter of a claim falls within the § 101 categories of possibly patentable subject matter."); *Id.* at 190 ("The question therefore of whether a particular invention is novel is "wholly apart from whether the invention falls into a category of statutory subject matter."").

the CCPA to "trivialize[] the holding in *Flook*, the principles that underlie[] *Benson*, and the settled line of authority reviewed in those opinions."¹³² The dissent further proceeded to compare *Flook*'s patent to *Diehr*'s patent and concluded that the two patents were substantively indistinguishable.¹³³ Moreover, the dissent attributed the majority's holding to a mischaracterization of *Diehr*'s claims,¹³⁴ thus, reaffirming the importance of characterization.¹³⁵

In a field of law, which was uncertain to begin with, *Diehr* seemed to have added to, rather than subtracted from, the uncertainty by raising more questions. For example, did *Diehr* effectively overrule *Flook* and *Benson* (was it possible for *Diehr* and *Flook* to harmoniously coexist)? Did the Supreme Court yield

¹³² *Id.* at 205 (Stevens, Brennan, Marshall, and Blackmun, JJ., dissenting).

¹³³ *Id.* at 211 n.31 (Stevens, Brennan, Marshall, and Blackmun, JJ., dissenting) ("The facts are difficult to distinguish from those in *Flook*. Both processes involved (1) an initial calculation, (2) continual remeasurement and recalculation, and (3) some control use of the value obtained from the calculation.").

¹³⁴ *Id.* at 210-211 (Stevens, Brennan, Marshall, and Blackmun, JJ., dissenting).

¹³⁵ See, e.g., *Diehr*, 450 U.S. at page n. 35 (Stevens, Brennan, Marshall, and Blackmun, JJ., dissenting);

Rubber-Tip Pencil Co. v. Howard, 87 U.S. 498, 505 (1874).

to the CCPA's method of analyzing patentable subject matter? Did patentability really depend on how an inventor characterized the subject matter? If so, then wouldn't patentability depend on the skill of the draftsman in drafting the claims? Lower courts effectively treated *Diehr* as overruling *Flook* and continued to expand the scope of patentable subject matter.

In *In re Abele*,¹³⁶ the CCPA addressed the issue of when patent claims did, or did not, contain statutory subject matter. In holding that certain claims were unpatentable in a method for improved computer assisted tomography, the CCPA began by characterizing the claimed invention (i.e., asking "What did the applicants invent?").¹³⁷ The CCPA ruled that if a "mathematical algorithm is implemented in a specific manner to define structural relationships between the physical elements of the claim (in apparatus claims) or to refine or limit claim steps (in process claims), the claim being otherwise statutory, the claim passes muster under § 101."¹³⁸ In essence, the CCPA restated, in its test for patentability, the old rule that "the

¹³⁶ *In re Abele*, 684 F.2d 902 (C.C.P.A. 1982).

¹³⁷ *Id.* at 907.

¹³⁸ *Id.* at 906.

embodiment of a principle into a machine or manufacture" is patentable.¹³⁹ Thus, the analysis, subsequently designated as the Freeman-Walter-Abele test,¹⁴⁰ consisted of two steps: first, determining whether a mathematical algorithm was recited in the claims; second, determining whether the algorithm was "applied in any manner to physical elements." This analysis was used by the CCPA in subsequent decisions.¹⁴¹

While continuing to apply the Freeman-Walter-Abele test to inventions, the Federal Circuit¹⁴² continued to broaden the scope

¹³⁹ *Smith v. Downing*, 22 F. Cas. 511, 513 (C.C.D. Mass. 1850) (No. 13,036).

¹⁴⁰ *Arrhythmia Research Technology, Inc. v. Corazonix Corp.*, 958 F.2d 1053, 1058 (Fed. Cir. 1992).

¹⁴¹ *See, e.g., In re Meyer*, 688 F.2d 789 (C.C.P.A. 1982) (Process and apparatus for determining probable malfunction in a system held unpatentable as not applying to physical elements);

Arrhythmia, 958 F.2d at 1058;

In re Schrader, 22 F.3d 290 (Fed. Cir. 1994);

In re Warmerdam, 33 F.3d 1354 (Fed. Cir. 1994);

In re Lowry, 32 F.3d 1597 (Fed. Cir. 1994);

In re Trovato, 42 F.3d 1376 (Fed. Cir. 1994);

State Street Bank & Trust Co. v. Signature Financial Group, Inc., 149 F.3d 1368 (Fed. Cir. 1998).

¹⁴² The present day Court of Appeals for the Federal Circuit is the same court as the Court of Customs and Patent Appeals.

of patentable subject matter to include "anything under the sun made by man."¹⁴³ Then, in *In re Schrader*,¹⁴⁴ a method for auctioning items was held unpatentable as merely reciting an algorithm. The court reasoned that there was no "[t]ransformation and reduction of an article to a different state or thing[,]" thus, making Schrader's invention unpatentable. Judge Newman's dissent, citing *In re Musgrave*,¹⁴⁵ argued that the sole limitation for patentability, despite previous disapproval by the Supreme Court,¹⁴⁶ should be "that it must be technologically useful."¹⁴⁷ This position by Judge Newman's would subsequently win the day.¹⁴⁸

In *In re Alappat*,¹⁴⁹ a highly divided court held that a means for creating a smooth waveform display in a digital oscilloscope was patentable subject matter because a computer operating with certain software was different from a computer operating without

¹⁴³ *Chakrabarty*, 447 U.S. at 309.

¹⁴⁴ *In re Schrader*, 22 F.3d 290 (Fed. Cir. 1994);

¹⁴⁵ *In re Musgrave*, 431 F.2d 882 (C.C.P.A. 1970).

¹⁴⁶ See *supra* text accompanying notes 99-115.

¹⁴⁷ *Musgrave*, 431 F.3d at 297.

¹⁴⁸ *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368 (Fed. Cir. 1998).

¹⁴⁹ *In re Alappat*, 33 F.3d 1526 (Fed. Cir. 1994).

that software. Essentially, the court seemed to do an end-run analysis around the well-settled principle that algorithms were not patentable. In taking the Freeman-Walter-Abele test to an extreme, and despite its own holding in *In re Walter*,¹⁵⁰ the court seemed to hold that the mere embodiment of an algorithm into a working computer would be sufficient to make that computer patentable subject matter (i.e., mere skill is enough to confer statutory status to an otherwise unpatentable subject matter). In so holding, the court intimated that practical utility was all that was necessary to impart statutory status to an algorithm.¹⁵¹ Moreover, the court distinguished "[l]aws of nature and natural phenomena" from "abstract ideas" stating that the former was not "new" while the latter was not "useful" until reduced to some practical application.¹⁵² Thus, the court seemed

¹⁵⁰ *In re Walter*, 618 F.2d 758, 770 (C.C.P.A. 1980) ("If § 101 could be satisfied by the mere recordation of the results of a nonstatutory process on some record medium, even the most unskilled patent draftsman could provide for such a step, thus converting a nonstatutory process to a statutory one with relative ease.").

¹⁵¹ *Alappat*, 33 F.3d at 1543 ("Rather, at the core of the Court's analysis in each of these cases lies an attempt by the Court to explain a rather straightforward concept, namely, that certain types of mathematical subject matter, standing alone, represent nothing more than abstract ideas until reduced to some type of practical application, and thus that subject matter is not, in and of itself, entitled to patent protection.").

¹⁵² *Id.* at 1543 n.18.

revert back to a "technologically useful" standard.

The dissent,¹⁵³ while agreeing that the proper standard was practical utility,¹⁵⁴ disagreed that the "mere association of digital electronics or a general purpose digital computer with a newly discovered mathematic operation does not per se bring that mathematic operation within the patent law."¹⁵⁵ The dissent, therefore, seemed to advocate that, either "mere skill" was still insufficient to transform nonstatutory subject matter into statutory subject matter,¹⁵⁶ or that the patentability of the

¹⁵³ Archer, C. J., and Nies, J., concurred on the issue of jurisdiction and dissented on the issue of patentable subject matter. Thus, for purposes of discussing patentable subject matter, the author refers to this portion of the opinion as the dissent.

¹⁵⁴ *Alappat*, 33 F.3d at 1552 (Archer, C. J., Nies, J., concurring in part and dissenting in part);

Id. at 1542 n.16.

¹⁵⁵ *Id.* at 1557.

¹⁵⁶ *Id.* at 1561 (Archer, C. J., Nies, J., concurring in part and dissenting in part) ("The presence of structure on the face of the claims does not ipso facto make the claimed invention or discovery one of statutory subject matter.");

Id. at 1566-1567 (Archer, C. J., Nies, J., concurring in part and dissenting in part) ("Thus, a known circuit containing a light bulb, battery, and switch is not a new machine when the switch is opened and closed to recite a new story in Morse code, because "invent[ion] or discover[y]" is merely a new story, which is nonstatutory subject matter. An old stereo playing a new song on a compact disc is not a new machine because the

invention should not turn on characterization.¹⁵⁷ In either case, the dissent seemingly approved of the "technologically useful" standard.

Judges Newman and Rader, concurring separately, agreed that the scope of patentable subject matter should not be limited because such limitation would eliminate the incentive provided by the patent laws and, in the end, would be detrimental to the public.¹⁵⁸

invention or discovery is merely a new song, which is nonstatutory subject matter.");

Id. at 1567 (Archer, C. J., Nies, J., concurring in part and dissenting in part) ("Yet a player piano playing Chopin's scales does not become a "new machine" when it spins a roll to play Brahms' lullaby. The distinction between the piano before and after different rolls are inserted resides not in the piano's changing quality as a "machine" but only in the changing melodies being played by the one machine.").

¹⁵⁷ *Id.* (Archer, C. J., Nies, J., concurring in part and dissenting in part) ("It is illogical to say that although a claim to a newly discovered mathematical operation to be performed by a computer is merely a nonstatutory discovery of mathematics, a claim to any computer performing that same mathematics is a statutory invention or discovery.").

¹⁵⁸ *Id.* at 1571 (Newman, J., concurring) ("To bar such inventions as Alappat's rasterizer from access to the patent system is to eliminate the incentive provided by this law, disserving not only technological industry, but the public benefit of improved technology. One must have a powerful reason to exclude technology from the scope of Title 35.");

Thus, despite the Supreme Court's disapproval of using "technologically useful" as a benchmark for patentability, the court appeared to adopt such a standard in *Alappat*.

Notwithstanding the lowered standard for patentable subject matter, the court, in *In re Warmerdam*,¹⁵⁹ rejected a method for controlling objects to avoid collisions as nothing more than manipulation of abstract ideas. The court reasoned that "the dispositive issue for assessing compliance with § 101 . . . [wa]s whether the claim [wa]s for a process that [went] beyond simply manipulating abstract ideas or natural phenomena."¹⁶⁰ Thus, even though a claimed invention was within the "technological arts," there still needed to be a "structural relationship" between the algorithm (i.e., the abstract idea, law of nature, or natural phenomena) and a "structural element." This viewpoint was endorsed in subsequent cases.¹⁶¹ Even after

Id. at 1583 (Rader, J., concurring) ("This court should not permit the Patent and Trademark Office to administratively emasculate research and development in this area by precluding statutory protection for algorithmic inventions.").

¹⁵⁹ *In re Warmerdam*, 33 F.3d 1354 (Fed. Cir. 1994).

¹⁶⁰ *Id.* at 1360.

¹⁶¹ *In re Lowry*, 32 F.3d 1579, 1583-84 (Fed. Cir. 1994);

In re Trovato, 42 F.3d 1376 (Fed. Cir. 1994); *In re Beauregard*, 53 F.3d 1583, 1584 (Fed. Cir. 1995).

such an expansion of statutory subject matter, questions still lingered. For example, how much of a relationship with a structural element would be enough to meet the threshold for "structural relationship?"

This question was answered in *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*¹⁶² The court, in approving a data processing system for a hub and spoke financial service configuration, held that any structure was sufficient for statutory subject matter.¹⁶³ Thus, as long as an inventor could show "usefulness," the requirements of § 101 seemed to be satisfied.¹⁶⁴

¹⁶² *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368 (Fed. Cir. 1998).

¹⁶³ *Id.* at 1373 ("Today, we hold that the transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces "a useful, concrete, and tangible result" - a final share price momentarily fixed for recording and reporting purposes and even accepted and relied upon by regulatory authorities and in subsequent trades.").

¹⁶⁴ *Id.* at 1375 ("The question of whether a claim encompasses statutory subject matter should not focus on which of the four categories of subject matter a claim is directed to - process, machine, manufacture, or composition of matter - but rather on the essential characteristics of the subject matter, in particular, its practical utility.").

SIGNALS

Given the state of the law, that practical utility in relation to a structural element is sufficient to confer statutory subject matter to a law of nature, a problem arises in the context of signals. In the wake of *Beauregard*,¹⁶⁵ there is little doubt that a signal may be claimed if it is embodied on any tangible medium.¹⁶⁶ It is, however, unclear whether a signal, per se (i.e., in the absence of a tangible medium), may be claimed as an invention because signals, per se, are not related to a structural element. They are, rather, in and of themselves, the structural element, their structure represented by nothing more than a mathematical equation (e.g., the wave equation in quantum physics).

Signals as Defined in the Scientific Community

Since modern systems (e.g., telecommunications systems, medical imaging systems, chemical analyzers, etc.) operate using some

¹⁶⁵ *In re Beauregard*, 53 F.3d 1583 (Fed. Cir. 1995).

¹⁶⁶ For example, Koo, U.S. Patent No. 5,568,202 (claiming "[an electronic reference signal] for minimizing the effects of ghosts occurring during the transmission and reception of a television signal over a communications path. ").

sort of signal, we should first define "signal."

Webster's dictionary provides that a "signal" is: in radio, etc. the electrical impulses transmitted or received.¹⁶⁷ Although that definition only provides for "electrical impulses," other types of signals may be encompassed in our analysis (e.g., magnetic impulses, continuous waves, etc.).

Signals play an important role in almost all areas of modern technology. For example, in the field of medical imaging, elaborate apparatuses are created for the purpose of detecting signals. Since these systems detect signals that are unique to a particular field of imaging (i.e., CT scanners detect only x-rays, magnetic resonance imaging (MRI) scanners only detect excited nuclear spins in a magnetic field, etc.), it is possible to define a complete system and method by properly defining the detected (or generated) signal. Thus, if one could claim a signal, then it would be possible to protect the unique system and method associated with the claimed signal.

One such example of this is the Koo Patent.¹⁶⁸ In Koo's system

¹⁶⁷ Webster's New World Dictionary, Warner Books, 1990.

¹⁶⁸ U.S. Patent No. 5,568,202 (issued Oct.22, 1996).

for improved echo cancellation, Koo claims "[a]n electronic reference signal" that is used in the cancellation of echoes. There is no problem with Koo's particular patent because the signal is embodied in a "system for minimizing effects of ghosts," thereby arguably meeting the *Beauregard* standard,¹⁶⁹ which held that the embodiment of signals in a tangible medium creates patentable subject matter. Claims 2 and 3 of the Koo patent, however, foreshadow problems that may arise in the context of signals. Claim 2 provides for a reference signal further defined by the equation:

$$(\tau) = \frac{1}{2\pi} \int_0^{\Omega} [A \cos(b\omega^2) + Aj \sin(b\omega^2)] W(\omega) e^{j\omega t} d\omega + \frac{1}{2\pi} \int_{-\Omega}^0 [A \cos(b\omega^2) - Aj \sin(b\omega^2)] W(\omega) e^{j\omega t} d\omega$$

The potential problem arises in situations where a mathematical equation would be the only way to portray an otherwise physical signal. Stated differently, the problem arises when the mathematical equation *is* the signal.

Signals as Defined by the Courts

¹⁶⁹ *In re Beauregard*, 53 F.3d 1583 (Fed. Cir. 1995).

Courts have also attempted to define and provide examples of signals.¹⁷⁰ The following cases provide examples of how courts have dealt with signals.

In *In re Musgrave*,¹⁷¹ the CCPA stated that "'signals' may take the form of impressions on a magnetic tape, electrical impulses in an analog or digital computer, or visible patterns on graph paper or on an oscilloscope screen."¹⁷² Thus, while not directly addressing the issue of whether signals were statutory subject matter, the CCPA intimated that signals may be sufficiently physical to be statutory.

¹⁷⁰ See, e.g., *In re Musgrave*, 431 F.2d 882, 893 (C.C.P.A. 1970);

In re Foster, 438 F.2d 1011 (C.C.P.A. 1971);

In re Castelet, 562 F.2d 1236 (C.C.P.A. 1977);

In re Walter, 618 F.2d 758 (C.C.P.A. 1980);

In re Taner, 681 F.2d 787 (C.C.P.A. 1982);

Arrhythmia Research Technology, Inc. v. Corazonix Corp., 958 F.2d 1053 (Fed. Cir. 1992);

In re Schrader, 22 F.3d 290 (Fed. Cir. 1994);

In re Trovato, 42 F.3d 1376 (Fed. Cir. 1994).

¹⁷¹ *In re Musgrave*, 431 F.2d 882 (C.C.P.A. 1970) (Process of correcting seismic data held to be patentable subject matter).

¹⁷² *Id.* at 893.

The court, in *In re Foster*,¹⁷³ held that signals were patentable subject matter.¹⁷⁴ The court, initially borrowing from the language of *Musgrave*, further defined signals as "[a] visual, aural, or other indication used to convey information[,]"¹⁷⁵ and "[a]n event or occurrence that transmits information from one location to another."¹⁷⁶ Regardless of the definitions provided by the court,¹⁷⁷ it was still unclear whether there was anything "physical" about such "signals." Thus, in holding signals to be patentable subject matter, it was unclear whether signals fell into statutory subject matter because they were in the "technological arts," or because they could be construed as "physical."

Despite the court's holding in *Musgrave* (that signals were

¹⁷³ *In re Foster*, 438 F.2d 1011 (C.C.P.A. 1971).

¹⁷⁴ *Id.* at 1016 (Stating that although signals were found statutory subject matter, the patent was held invalid under the second paragraph of 35 U.S.C. § 112).

¹⁷⁵ *Id.*

¹⁷⁶ *Id.*

¹⁷⁷ *Id.* "Early signals were visible signs and sounds (heliograph, semaphore, whistles, etc.). Today signal is used in the technical sense for electrical or wireless transmission of important information. In the near future, optical (modulated laser) signals may reappear as communication media."

patentable subject matter), in *In re Castelet*,¹⁷⁸ the CCPA held that the mere transmittal of electrical signals was not sufficient to confer statutory status.¹⁷⁹ The court reasoned that "nonstatutory processes do not automatically and invariably become patentable upon incorporation of reference to apparatus."¹⁸⁰ Thus, it appeared that the patentability of signals remained uncertain. In other words, at this point, no clear guidance was provided by the courts on the patentability of signals. This ambiguity with reference to signals (i.e., patentable in some instances while not patentable in others) was clarified in *In re Walter*.¹⁸¹ In *Walter*, the CCPA, while holding a seismic prospecting system unpatentable, examined the inventor's "partial product signal" in relation to the invention and held that, "[w]hile these products [we]re termed 'signals,' there [wa]s nothing necessarily physical about them beyond the

¹⁷⁸ *In re Castelet*, 562 F.2d 1236 (C.C.P.A. 1977).

¹⁷⁹ *Id.* 1244 (C.C.P.A. 1977) ("That the computer is instructed to transmit electrical signals, representing the results of its calculations, does not constitute the type of 'post solution activity' found in *Flook, supra*, and does not transform the claim into one for a process merely using an algorithm.").

¹⁸⁰ *Id.*

¹⁸¹ *In re Walter*, 618 F.2d 758 (C.C.P.A. 1980).

fact that they [we]re held in some physical storage medium."¹⁸²

The CCPA further provided that the "signals . . . may represent either physical quantities or abstract quantities[,]"¹⁸³ and that Walter's claims were unclear as to which his "signals" represented. Thus, signals appeared to be patentable if they represented "physical quantities" and unpatentable if they represented "abstract quantities." This viewpoint was endorsed in subsequent CCPA decisions.¹⁸⁴ It appeared, therefore, that

¹⁸² *Id.* at 769-770.

¹⁸³ *Id.* at 770.

¹⁸⁴ *In re Taner*, 681 F.2d 787, 790 (C.C.P.A. 1982) ("Though the board conceded that appellants' process includes conversion of seismic signals into a different form, it took the position that 'there is nothing necessarily physical about 'signals'' and that 'the end product of [appellants' invention] is a mathematical result in the form of a pure number.' That characterization is contrary to the views expressed by this court in *In re Sherwood*, 613 F.2d 809 (C.C.P.A. 1980), where signals were viewed as physical and the processes were viewed as transforming them to a different state.");

Arrhythmia Research Technology, Inc. v. Corazonix Corp., 958 F.2d 1053, 1059 (Fed. Cir. 1992) ("These claimed steps of 'converting,' 'applying,' 'determining,' and 'comparing' are physical process steps that transform one physical, electrical signal into another. The view that 'there is nothing necessarily physical about 'signals'' is incorrect.");

In re Schrader, 22 F.3d 290, 294 (Fed. Cir. 1994), referring to *Arrhythmia Research Technology, Inc. v. Corazonix Corp.*, 958 F.2d 1053 (Fed. Cir. 1992), *In re Abele*, 684 F.2d 902 (C.C.P.A. 1982), and *In re Taner*, 681 F.2d 787 (C.C.P.A. 1982) ("These claims all involved the transformation or conversion of subject matter representative of or constituting physical activity or

the patentability of signals depended solely on the characterization of the term "signal." If the inventor characterized "signals" as a physical quantity (i.e., electrocardiograph, seismic wave, etc.), then they would fall within statutory subject matter. If, however, "signals" were characterized as an abstract quantity (i.e., pure number, bid prices, etc.), then they would fall under nonstatutory subject matter. The CCPA further held that the reason for abstract quantities being unpatentable was because abstract quantities,

objects. In *Arrhythmia*, it was electrocardiograph signals representative of human cardiac activity; in *Abele*, it was X-ray attenuation data representative of CAT scan images of physical objects; and in *Taner*, it was seismic reflection signals representative of discontinuities below the earth's surface. Schrader's claims, except for incidental changes to a 'record,' do not reflect any transformation or conversion of subject matter representative of or constituting physical activity...");

In re Schrader, 22 F.3d at 297 (Newman, J., dissenting) ("All mathematical algorithms transform data, and thus serve as a process to convert initial conditions or inputs into solutions or outputs, through transformation of information. Data representing bid prices for parcels of land do not differ, in section 101 substance, from data representing electrocardiogram signals (*Arrhythmia*) or parameters in a process for curing rubber (*Diehr*).");

In re Trovato, 42 F.3d 1376, 1382 (Fed. Cir. 1994) ("Although Trovato points to the 'signals' drafted in some of their claims, indicating the electrical signals internally transmitted by a computer as part of its solution of the budding process, the mere noting of 'signals' does not transform their inventions into statutory subject matter under the circumstances presented here.").

like abstract ideas, were not "useful" unless reduced to practice (i.e., the abstract quantity must have a relationship to a physical element).¹⁸⁵

Courts, therefore, intimated that signals, with regard to a pure § 101 analysis, if characterized as a physical quantity, would be considered statutory subject matter.

The question still remained, however, whether a signal, which represents a physical quantity, would be patentable if it was represented by a mathematical equation (e.g., the wave equation in quantum physics), and that equation was the only method of properly representing the signal in the context of the invention.¹⁸⁶ Unlike inventions, which "contain[] a mathematical algorithm as one component,"¹⁸⁷ it is possible, in signals, to have the mathematical formula be that invention (e.g., claims 2

¹⁸⁵ Although courts have typically analyzed "abstract ideas" under § 101, the author submits that the analysis is more proper under § 112. The practical utility seems more related to the enablement requirement of § 112 than it does to statutory subject matter requirement of § 101.

¹⁸⁶ See, e.g., Claims 2 and 3 of Koo's patent, U.S. Patent No. 5,568,202.

¹⁸⁷ Parker v. Flook, 437 U.S. 584, 594 (1978).

and 3 of the Koo patent).¹⁸⁸ In such a situation, the question remains whether the "signal" would be statutory subject matter because it represents a "physical quantity," or whether it would be nonstatutory subject matter because it wholly preempts the use of that mathematical equation.¹⁸⁹ Because there is a good chance that such issues may arise (e.g., in the context of wireless communications), it is necessary to reexamine the procedure for analyzing the scope of patentable subject matter under § 101.

A Possible Solution to Examining the Patentability of Signals, Per Se

The Supreme Court has held that Congress intended to include "everything under the sun made by man" as statutory subject matter under § 101.¹⁹⁰ The Court, however, has also voiced the concern that abstract ideas and principles of nature (e.g., mathematical equations, non-physical signals, etc.), if monopolized even for a short while, would deprive the public of

¹⁸⁸ U.S. Patent No. 5,568,202 (1996).

¹⁸⁹ *In re Castelet*, 562 F.2d 1236, 1245 (C.C.P.A. 1977) ("We think it is clear that in enacting section 101 Congress meant to exclude principles or laws of nature and mathematics, of which equations are an example, from even temporary monopolization by patent").

¹⁹⁰ *Chakrabarty*, 447 U.S. at 309 (citation omitted).

the "basic tools of scientific and technological work."¹⁹¹ Thus, the Court has disallowed patents on such abstract ideas.

It is the author's view that in a pure § 101 analysis of statutory subject matter, since almost "anything under the sun" may be manipulated by man to a useful end, everything that fits into the common definition of "process, machine, manufacture, or composition of matter"¹⁹² should be regarded as being within § 101. Subsequently, the degree of abstraction (i.e., whether the claims are abstract) should be determined under § 112¹⁹³ and, depending on the degree of abstraction, be allowed as being sufficiently enabling or rejected as not being sufficiently enabling. This approach is similar to the approach taken by the

¹⁹¹ *Benson*, 409 U.S. at 67.

¹⁹² 35 U.S.C. § 101.

¹⁹³ 35 U.S.C. § 112, ¶ 1. ("The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.");

35 U.S.C. § 112, ¶ 2. ("The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.").

Supreme Court in the dissent of *Le Roy v. Tatham*¹⁹⁴ and the majority in *O'Reilly v. Morse*.¹⁹⁵ If we recall, in *O'Reilly*, Morse's eighth claim was held unpatentable, not because it fell outside the bounds of patentable subject matter but, rather, because there was insufficient disclosure.¹⁹⁶ Moreover, this approach seems to have worked well when utilized by the CCPA (now the Court of Appeals for the Federal Circuit).¹⁹⁷

Although there may be other methods for analyzing such claims, the author believes that portions of the complete opinion (majority and dissent) in *O'Reilly*¹⁹⁸ as well as portions of the majority opinions in *Rubber-Tip Pencil Co.*,¹⁹⁹ *Chakrabarty*,²⁰⁰ and *Diehr*²⁰¹ present the most logical and reasonable approach to examining patentability. In order to provide a concrete example of the proposed method of analysis, Koo's claims for "an

¹⁹⁴ *Le Roy v. Tatham*, 55 U.S. 156 (1852).

¹⁹⁵ *O'Reilly v. Morse*, 56 U.S. 62 (1853).

¹⁹⁶ *Id.* at 120.

¹⁹⁷ See, e.g., *In re Foster*, 438 F.2d 1011 (C.C.P.A. 1971).

¹⁹⁸ *O'Reilly v. Morse*, 56 U.S. 62 (1853).

¹⁹⁹ *Rubber-Tip Pencil Co. v. Howard*, 87 U.S. 498 (1874).

²⁰⁰ *Diamond v. Chakrabarty*, 447 U.S. 309 (1980).

²⁰¹ *Diamond v. Diehr*, 450 U.S. 175 (1981).

improved ghost cancellation reference signal"²⁰² will be examined using this method.

Beginning with *Rubber-Tip Pencil Co.*, the first step to analyzing patentability is "to examine the description which the patentee has given of his new article of manufacture, and determine what it is"²⁰³ In this step of the analysis, the only pertinent § 101 inquiry is whether the subject matter in question is "made by man."²⁰⁴ If this question is answered negatively, then the subject matter, for § 101 purposes, is nonstatutory subject matter, and the analysis of patentability is complete. If, on the other hand, the question is answered affirmatively, then the subject matter, for § 101 purposes, is statutory subject matter. At this point, only the § 101 analysis is complete and we would further examine the other sections of 35 U.S.C. (e.g., §§ 102, 103, and 112) to determine whether the claimed invention, despite statutory subject matter, is patentable. Thus, if a signal is in any way "made by man" (e.g., generated from an electronic transmitter, manipulated by

²⁰² U.S. Patent No. 5,568,202 (1996).

²⁰³ *Rubber-Tip Pencil Co.*, 87 U.S. at 505.

²⁰⁴ *Chakrabarty*, 447 U.S. at 303.

a medical imaging system, etc.), then the signal would be statutory subject matter, and further analysis would be needed to determine patentability.

Taking Koo's claims,²⁰⁵ for example, we can analyze whether the "electronic reference signal" is "made by man."²⁰⁶ Since the "electronic reference signal" is produced from a man-made apparatus (i.e., the signal is man-made),²⁰⁷ it clearly falls within the statutory category in the proposed analysis. Thus, the § 101 inquiry is complete, and we must then look to §§ 112, 102, and 103 to further determine patentability.

Once it is determined that the subject matter in question is statutory, the next inquiry would be to determine "[i]f he has truly stated the principle, nature and extent of his art or invention."²⁰⁸ This, in essence, is a § 112 analysis to determine whether the inventor has, through his written disclosure, sufficiently "enable[d] any person skilled in the

²⁰⁵ U.S. Patent No. 5,568,202 (1996).

²⁰⁶ *Chakrabarty*, 447 U.S. at 309.

²⁰⁷ See U.S. Patent No. 5,161,017, which describes the apparatus for generating the electronic reference signal.

²⁰⁸ *O'Reilly*, 56 U.S. at 135.

art to which it pertains . . . to make and use the . . . invention."²⁰⁹ It is worthwhile to note that the § 112 analyses is wholly independent of the § 101 analysis. § 101 simply determines whether the subject matter is "made by man,"²¹⁰ while § 112 determines whether the description of that subject matter is sufficiently complete. Thus, in the context of signals, if the signal in question is "made by man," the next step is to determine whether the written disclosure sufficiently enables one of ordinary skill in the art to generate such a signal.

In Koo's "electronic reference signal," we look to see if there is sufficient detail to enable one of ordinary skill in the art to make and use his reference signal.²¹¹ The patent provides details for generating the signal²¹² using a specific apparatus.²¹³ Moreover, the inventor provides specific details

²⁰⁹ 35 U.S.C. § 112, ¶ 1.

²¹⁰ *Chakrabarty*, 447 U.S. at 309.

²¹¹ Although § 112 contains other requirements, the author focuses on the enablement requirement of § 112 because the courts' incorporation of § 112 into its § 101 analysis typically conflates the enablement requirement of § 112 into the § 101 analysis.

²¹² U.S. Patent No. 5,568,202, col. 3, lines 8 - 67; col. 4, lines 1 - 3.

²¹³ U.S. Patent No. 5,568,202, col. 2, lines 63 - 67; col. 3, lines 1 - 8.

on the determination of the signal's characteristics²¹⁴ and the method for determining these characteristics.²¹⁵ Regardless of whether these descriptions are sufficient to "enable any person skilled in the art . . . to make and use the . . . invention,"²¹⁶ it is apparent that this inquiry is entirely independent of the § 101 inquiry, which only asks whether the claimed invention is "made by man."²¹⁷ It is worthwhile to note that for this particular invention, the inventor has not merely claimed a mathematical equation but, rather, has claimed a signal (i.e., arguably a physical entity), which embodies the equation.

Once the invention passes § 101 and § 112 scrutiny, further analysis would be necessary to determine whether § 102 (novelty) and § 103 (obviousness) requirements would be met. §§ 102 and 103 will not be discussed further since most of the confusion in the courts regarding § 101 relates to the conflation of § 112's enablement requirement into the subject matter analysis, and not the conflation of § 102 (novelty) or § 103 (obviousness) into § 101.

²¹⁴ See, e.g., U.S. Patent No. 5,568,202, col. 4, lines 4 - 35.

²¹⁵ U.S. Patent No. 5,568,202, col. 2, line 45 - col. 4, line 3.

²¹⁶ 35 U.S.C. § 112, ¶ 1.

Thus, regardless of whether or not the signal is characterized by a mathematical equation, the proper analysis to the patentability of signals (or other potential "abstracts") lies in a § 112 analysis,²¹⁸ and not an artificial narrowing of § 101 subject matter as courts have typically done. If this were not the case, then depending on the inventor's characterization of the signal, the same subject matter (i.e., the signal) could possibly be statutory in one instance, and nonstatutory in another instance. "Logically, the identical [subject] cannot be first within and later without the categories of statutory subject matter, depending on such extraneous factors [i.e., characterization]."²¹⁹ On the other hand, the identical subject matter (i.e., the signal) may meet § 112 enablement requirements if properly defined (i.e., properly characterized) and not meet

²¹⁷ *Chakrabarty*, 447 U.S. at 309.

²¹⁸ 35 U.S.C. § 112, ¶ 1. ("The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.");

35 U.S.C. § 112, ¶ 2. ("The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.").

²¹⁹ *In re Musgrave*, 431 F.2d 882, 889 (C.C.P.A. 1970).

§ 112 requirements if not properly defined (i.e., not properly characterized). Hence, despite the courts' longstanding approach of analyzing abstract ideas under § 101, the author submits that the proper analysis for such ideas should properly be under § 112.

CONCLUSION

Although *Benson*²²⁰ and *Flook*²²¹ may turn out differently under the proposed analysis, it is arguable that *Diehr*²²² has effectively overruled *Benson* and *Flook*. Hence, whether under the proposed analysis or under *Diehr*, the results of current patent decisions would allow for broad inclusion of subject matter under § 101. The proposed method differs from previous court decisions in that, under the proposed method, extraneous factors (e.g., novelty, obviousness, enablement, etc.) are not improperly imported into subject matter analysis, thus, simplifying the analysis.

The Freeman-Walter-Abele test is similar to the proposed method

²²⁰ *Gottschalk v. Benson*, 409 U.S. 63 (1972).

²²¹ *Parker v. Flook*, 437 U.S. 584 (1978).

²²² *Diamond v. Diehr*, 450 U.S. 175 (1981).

of analysis. However, that test continues to analyze the patentability of algorithms (i.e., abstract ideas) under § 101, rather than under § 112. It is the author's view that the proposed method for determining patentability (i.e., analyzing abstract ideas under § 112 and independently analyzing §§ 101, 102, 103, and 112 without commingling another section's factors) would clarify the state of the law and provide clearer guidance to inventors, as well as the Patent and Trademark Office, during the process of patent prosecution. Furthermore, the structure of the patent statutes supports the proposed analysis. Consistent with Congress' intent, it appears that the language in § 101 provides for almost limitless possibilities in patentable subject matter. On the other hand, §§ 112, 102, and 103 contain limiting language on the issuing of patents (i.e., the invention must be sufficiently described, novel, and nonobvious).

The proposed analysis is more consistent with the language of the statute, the intent of Congress, and the structure and layout of the statute, and the application of this analysis clarifies much of the confusion produced from the seemingly conflicting court decisions.