

9-1-1980

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Recommended Citation

Brent J. Jensen, *Live, Human-made Bacteria As Patentable Subject Matter Under 35 U.S.C. 5 101: Diamond v. Chakrabarty*, 1980 BYU L. Rev. 705 (1980).

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Live, Human-made Bacteria As Patentable Subject Matter Under 35 U.S.C. § 101: *Diamond v. Chakrabarty*

For 200 years federal courts have generally interpreted broadly Congress' power to grant patents.¹ However, because patent law is of statutory origin,² for an invention to be patentable it must fit into one of the four categories listed in 35 U.S.C. section 101:³ process,⁴ machine,⁵ manufacture,⁶ or composition of matter.⁷ The Supreme Court has held that these categories do

1. The Constitution provides that Congress shall have power "[t]o 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." U.S. CONST. art. I, § 8, cl. 8.

In *Kendal v. Winsor*, 62 U.S. (21 How.) 322, 328 (1858) the Supreme Court stated that "[t]he true policy and ends of the patent laws . . . [contemplated and necessarily implied] their extensions, and increasing adaptation to the uses of society." Later the Court emphasized that courts "should not read into the patent laws limitations and conditions which the legislature ha[d] not expressed." *United States v. Dubilier Condenser Corp.*, 289 U.S. 178, 199 (1933). The very justification for the existence of the patent laws was seen to lie in their ability "to serve the ends of science—to push back the frontiers of chemistry, physics, and the like; to make a distinctive contribution to scientific knowledge." *Great Atl. & Pac. Tea Co. v. Supermarket Equip. Corp.*, 340 U.S. 147, 154 (1950) (Douglas, J., concurring).

2. *In re McKellin*, 529 F.2d 1324, 1333 (C.C.P.A. 1976) (Markey, C.J., concurring).

3. Section 101 provides as follows: "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." 35 U.S.C. § 101 (1976).

4. A process is a mode of treatment of certain materials to produce a given result. It is an act, or series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing. If new and useful, it is just as patentable as is a piece of machinery. In the language of the patent law, it is an art.

Cochrane v. Deener, 94 U.S. 780, 788 (1876).

5. "The term machine includes every mechanical device or combination of mechanical powers and devices to perform some function and produce a certain effect or result." *Corning v. Burden*, 56 U.S. (15 How.) 252, 267 (1853).

6. "'Manufacture,' as well defined by the Century Dictionary, is 'the production of articles for use from raw or prepared materials by giving to these materials new forms, qualities, properties, or combinations, whether by hand-labor or by machinery.'" *American Fruit Growers, Inc. v. Brogdex Co.*, 283 U.S. 1, 11 (1930).

7. "This phrase [composition of matter] covers all compositions of two or more substances and includes all composite articles, whether they be results of chemical union, or of mechanical mixture, or whether they be gases, fluids, powers or solids." *Shell Dev. Co. v. Watson*, 149 F. Supp. 279, 280 (D.D.C. 1957), *aff'd*, 252 F.2d 861 (D.C. Cir. 1958). The

not include certain "products of nature" such as mathematical formulae, ideas, or laws of nature.⁸ Nevertheless, Congress in 1930 enacted a bill stating that most asexually reproducing plants are patentable even though they might be considered products of nature.⁹ The Supreme Court recently expanded the area of live, patentable subject matter by holding in *Diamond v. Chakrabarty* that "a live, human-made microorganism" is a manufacture or a composition of matter and therefore patentable under 35 U.S.C. section 101.¹⁰

Using a process of plasmid migration, Ananda Chakrabarty produced a strain of bacteria capable of metabolizing the hydrocarbons that constitute crude oil.¹¹ In 1972 he filed for a patent on this invention.¹² The patent application contained three types of claims: (1) claims for the method of producing the bacteria, (2) claims for the bacteria mixed with a carrier material such as straw and (3) claims for the bacteria themselves.¹³ The patent examiner allowed the first two types of claims but rejected the claims for the bacteria themselves on the ground that these claims were "drawn to a thing occurring in nature that is substantially unaltered and thus nonstatutory subject matter [under 35 U.S.C. section 101]."¹⁴

Supreme Court adopted this definition in the instant case. *Diamond v. Chakrabarty*, 447 U.S. 303, 308 (1980).

8. See, e.g., *Gottschalk v. Benson*, 409 U.S. 63, 71, 72 (1972)(mathematical formula); *Rubber-Tip Pencil Co. v. Howard*, 87 U.S. (20 Wall.) 498, 507 (1874)(ideas); *O'Reilly v. Morse*, 56 U.S. (15 How.) 62, 120 (1853)(electromagnetism).

9. Plant Patent Act, ch. 312, 46 Stat. 376 (1930)(current version at 35 U.S.C. §§ 161-164 (1976)). Tuber-propagated plants, although asexually reproducing, were excluded from patent protection. *Id.*

10. *Diamond v. Chakrabarty*, 447 U.S. 303, 305, 310 (1980). The Court's use of the term "human-made" may be confusing. Ananda Chakrabarty did not create life. He merely inserted previously existing plasmids into certain existing bacteria to endow the bacteria with the capability to degrade oil, an ability they previously had not possessed. A better term would be "genetically altered."

11. The four main hydrocarbons that constitute crude oil are n-octane, camphor, salicylate, and naphthalene. *In re Bergy*, 596 F.2d 952, 970 (C.C.P.A. 1979).

12. The question of whether the bacteria were patentable did not affect the fact that they were an invention: "It is time to settle the point that the terms invent, inventor, [and] inventive . . . are unrelated to deciding whether the statutory requirements for patentability . . . have been met. There is always an invention; the issues is [sic] its patentability." *In re Bergy*, 596 F.2d 952, 962 (C.C.P.A. 1979)(emphasis in original).

13. Patent Application of Ananda M. Chakrabarty (June 7, 1972), reprinted in Petitioner's Brief for Certiorari app., at 40-77, *Diamond v. Chakrabarty*, 447 U.S. 303 (1980).

14. Letter from Patent Examiner to Ananda Chakrabarty (January 11, 1974), reprinted in Petitioner's Brief for Certiorari at 166a.

The Court incorrectly said that the examiner also rejected the application on the ground that living things were not patentable subject matter. 447 U.S. at 306. See *In re*

On appeal the Patent Office Board of Appeals (POBA) reversed the examiner's finding that the bacteria were an unaltered product of nature. Nevertheless, the POBA affirmed the examiner's rejection of the claims for the bacteria themselves on the ground that living things simply are not patentable subject matter under section 101.¹⁵

At the next level of review, the Court of Customs and Patent Appeals (CCPA) reversed the POBA's decision relying on the authority of its holding in *In re Bergy* that in patent law there is no significance to the fact that the subject matter sought to be patented is alive.¹⁶ When the Supreme Court later remanded *Bergy*¹⁷ for further consideration in light of *Parker v. Flook*,¹⁸ a case holding that an algorithm¹⁹ is unpatentable, the CCPA vacated its earlier decision in *Chakrabarty* and recalled it for the same reconsideration the court would give *Bergy*.²⁰ After reconsidering the cases and finding that *Flook* shed no light on them, the CCPA affirmed its earlier decision to grant *Chakrabarty's* patent claims.²¹ The Commissioner of Patents appealed to the Supreme Court.²²

The issue presented to the Supreme Court in the instant case was whether "a live, human-made microorganism [was] patentable subject matter under [the patent statute]."²³ In its opinion the Court noted that the broad constitutional power to grant patents given to Congress was intended to foster "a positive effect on society through the introduction of new products and processes of manufacture into the economy."²⁴ The Court reasoned that the meanings of manufacture and composition of matter as used by Congress in the patent statute were expansive,

Chakrabarty, 571 F.2d 40, 42 (C.C.P.A. 1978); *In re Bergy*, 596 F.2d 952, 971 (C.C.P.A. 1979).

15. The POBA based its rejection on the legislative history of the Plant Patent Act of 1930 that provides patent protection for most asexually reproducing plants. Petitioner's Brief for Certiorari at 159a-64a.

16. *In re Bergy*, 563 F.2d 1031, 1038 (C.C.P.A. 1977); *In re Chakrabarty*, 571 F.2d 40, 43 (C.C.P.A. 1978).

17. *Parker v. Bergy*, 438 U.S. 902 (1978)(mem.).

18. 437 U.S. 584 (1977).

19. The Court defined an algorithm as a procedure for solving a given type of mathematical problem. *Id.* at 585 n.1.

20. *In re Bergy*, 596 F.2d 952, 957 (C.C.P.A. 1979).

21. *Id.* at 967, 987.

22. *Parker v. Bergy*, 444 U.S. 924 (1979)(mem.).

23. 447 U.S. at 305.

24. *Id.* at 307 (quoting *Kewanee Oil Co. v. Bicron Oil Corp.*, 416 U.S. 470, 480 (1974)).

especially in view of Congress' use in that statute of a comprehensive "any" to modify the terms.²⁵ The Court found that this interpretation was supported by the legislative history of the 1952 codification of the patent laws, which showed that Congress intended the subject matter of section 101 to "include anything under the sun that is made by man."²⁶ The Court contrasted *Chakrabarty's* altered bacteria with the newly discovered but unaltered bacteria in *Funk Brothers Seed Co. v. Kalo Inoculant Co.*²⁷ The Court found that in *Chakrabarty* no natural phenomenon had been claimed as in *Funk*, but a nonnaturally occurring manufacture or composition of matter—a product of man having a distinctive name, character, and use.²⁸

One of the Commissioner's main arguments against the patentability of microorganisms was based on the Plant Patent Act of 1930 and the Plant Variety Protection Act of 1970. The 1930 Act explicitly stated that most asexually reproducing plants were patentable, but did not mention bacteria.²⁹ The 1970 Act provided protection for new varieties of sexually reproducing plants but specifically excluded bacteria.³⁰ It was argued that the omission or exclusion of bacteria from these statutes indicated that Congress did not intend for bacteria to be patentable in the absence of specific legislation. The Court, however, refused to view these acts as evidence that other living things not

25. 447 U.S. at 308. The Court cautioned, however, that such comprehensive language could not include certain phenomena or laws of nature. *Id.* at 309.

26. *Patent Law Codification and Revision: Hearings on H.R. 3760 Before Subcomm. No. 3 of the Comm. on the Judiciary, 82d Cong., 1st Sess. 37 (1951)*(statement of P.J. Federico); H.R. REP. No. 1923, 82nd Cong., 1st Sess. 6; S. REP. No. 1979, 82d Cong., 1st Sess. 5, reprinted in [1952] U.S. CODE CONG. & AD. NEWS 2394, 2399.

27. 333 U.S. 127 (1948). Mr. Bond patented a mixture of six strains of certain species of bacteria used to infect the roots of leguminous plants, thus enabling the plants to take nitrogen from the air for conversion to organic nitrogenous compounds. Unlike other strains of these same species of bacteria, the new strains did not exhibit a mutually inhibitive effect and were, therefore, more effective in infecting the plants. *Id.* at 129-30. Therefore, the Court there found that the patentee had merely discovered "the handiwork of nature" and held that the patent was invalid. *Id.* at 131. Note, however, that if living things were absolutely unpatentable there would have been no need for the *Funk* Court to have made any distinction based on the properties of the bacteria concerned.

28. 447 U.S. at 309-10.

29. Plant Patent Act, ch. 312, 46 Stat. 376 (1930)(current version at 35 U.S.C. §§ 161-164 (1976)).

30. 7 U.S.C. §§ 2402-2583 (1976). "The breeder of any novel variety of sexually reproducing plant (other than fungi, bacteria, or first generation hybrids) who has so reproduced the variety, . . . shall be entitled to plant variety protection therefor . . ." *Id.* at § 2402(a).

specifically included were automatically excluded from being manufactures or compositions of matter, and, therefore, from being patentable subject matter. The Court instead reasoned that these acts merely refuted the long held assumptions that plants could not adequately be described as required under then existing law, and that patents could not be granted for plants, even if they were new varieties, when they were reproduced by operation of nature.³¹ The Court also rejected the idea that Congress had made any distinction between patentable and nonpatentable inventions based on the presence or absence of life and emphasized that the true congressional intent merely recognized a "relevant distinction . . . between products of nature, whether living or not, and human-made inventions."³² The Court reasoned that the 1970 Act was enacted to extend patent protection to sexually reproducing plants, all of which had been excluded from patent protection by the 1930 Act because in 1930 such new plant varieties could not be reproduced true-to-type.³³ Since Congress had given no explanation for the exclusion of bacteria

31. 447 U.S. at 311-12.

It may be doubted whether a valid patent can be granted for a plant even if it is a new variety, when that plant is reproduced by operation of nature, aided only by the act of the patentee in grafting it by the usual methods, and a very serious question arises as to whether the definition given to the words "invention" and "discovery" in the proviso in the bill, namely that they shall be interpreted "in the sense of finding a thing already existing and reproducing the same as well as in the sense of creating," does not go beyond the power which the Constitution grants to Congress. Under the proviso the person who is given the right to get a patent, if the found variety is new, has done nothing whatever in any way toward creating that variety.

. . . .

Further, and more important, there at once arises the difficulty of defining in a written document . . . constituting part of the patent . . . , the differences which identify a new variety from previously known varieties.

Plant Patents: Hearings on H.R. 11372 Before the Comm. on Patents, 71st Cong., 2d Sess. 6, 7 (1930)(letter from Thomas E. Robertson, Commissioner of Patents).

The general patent law does not permit grant of a valid patent on a so-called "product of nature," since no inventive act can be presumed. Plants found in an uncultivated state cannot be presumed to have been created by other than nature.

Prior to the Plant Patent Act, this doctrine barred the patenting of plants. *Patent Law Revision: Hearing on S. 2, S. 1042, S. 1377, S. 2164, S. 2597 Before the Subcomm. on Patents, Trademarks, and Copyrights of the Comm. on the Judiciary, 90th Cong., 2d Sess., part 2, 790 (1968)*(statement of Donald G. Daus).

32. 447 U.S. at 313.

33. *Id.* The Court is incorrect in saying that the 1970 Act extended patent protection to sexually reproducing plants. The 1970 Act was not a patent law. S. REP. NO. 91-1246, 91st Cong., 2d Sess. 3 (1970). The dissent made this same error. See 447 U.S. at 320 & n.5, 321 (Brennan, J., dissenting).

from the 1970 Act,³⁴ the Court found no clear indication that Congress had focused on the issue and therefore found no basis for modifying the plain meaning of the words Congress used in section 101.

The dissent rejected the majority's analysis of the legislative history of the plant acts and said that the Court should not extend patent protection "further than Congress has provided."³⁵ Contending that Congress had felt it necessary to enact specific legislation to create patent protection for plants, the dissent maintained that Congress could not have intended other living things also to be patentable without further specific legislation. The dissent also argued that under the majority's analysis plants would have been patentable without the 1930 and 1970 Acts, which were therefore arguably superfluous legislation. Noting that bacteria had been explicitly excluded from the Plant Variety Protection Act of 1970 and reasoning that this demonstrated Congress' intent that bacteria not be included "within the scope of patent protection," the dissent found the majority's interpretation of the plant acts unpersuasive. The dissent argued, "Congress, assuming that animate objects as to which it had not specifically legislated could not be patented, excluded bacteria from the set of patentable organisms."³⁶

Although the facts of the instant case warrant the Court's particular holding that genetically altered bacteria are patentable subject matter, the Court unnecessarily failed to follow the reasoning established in its prior decisions and thus made an unwarranted alteration in the definitions of what can be patented. *Chakrabarty* presented the Court with a question of first impression—whether a live, genetically altered microorganism was patentable under section 101 of the patent statute. This inquiry actually presented two questions that should be considered separately. First, whether a genetically altered microorganism fits the literal definition of any category of patentable subject matter under section 101. Second, if the altered microorganism does fit the definition, whether it nevertheless is unpatentable be-

34. 447 U.S. at 313, 321. See H.R. REP. No. 91-1605, 91st Cong., 2d Sess. 6, 7; S. REP. No. 91-1138, 91st Cong., 2d Sess. 7, reprinted in [1970] U.S. CODE CONG. & AD. NEWS 5082, 5088.

35. 447 U.S. at 319.

36. *Id.* at 321. Contrary to the dissent's statement, exclusion of bacteria from the 1970 Act did not exclude them from the "set of patentable organisms." The 1970 Act was not a patent law. S. REP. No. 91-1246, 91st Cong., 2d Sess. 3 (1970).

cause it is alive. The Supreme Court's opinion addressed the first but not the second question. This Casenote will consider both these questions in light of certain facts the Supreme Court should have considered. The conclusion reached here is that even though the Court's holding was correct, its reasoning would have been more compelling if the Court had examined these facts and followed its own precedents more closely.

The Court has previously given definitions to most of the four categories of patentable subject matter. One of these four categories is the "manufacture." Under the traditional definition, a manufacture is an article produced "for use from raw or prepared materials by giving to these materials new forms, qualities, properties, or combinations."³⁷ In addition, this transformation must be of a degree sufficient to give the invention "a distinctive name, character or use from that of [the original materials]."³⁸ In the instant case the Court quoted this traditional definition³⁹ but did not directly apply it. Instead, the Court reasoned that because Chakrabarty's discovery was "not nature's handiwork, but his own; accordingly it [was] patentable subject matter under § 101" as a manufacture.⁴⁰ The definition of manufacture, however, does not raise the issue of whether the materials used are products of nature: "All of the tangible things with which man deals and for which patent protection is granted are products of nature in the sense that nature provides the basic source materials."⁴¹ Ore for metals, wood for lumber and silicates for glass are but three examples of natural products that man transforms into patentable inventions. By focusing on whether the bacteria were products of nature instead of whether the materials were sufficiently transformed under the traditional test for a manufacture, the Court unnecessarily departed from its earlier decisions and made an unwarranted alteration in the test for patentability.

Chakrabarty's microorganisms presumably would have been held to be a manufacture under the traditional test. The raw materials used to produce the microorganisms were four types of plasmids and a strain of *Pseudomonas aeruginosa*, which is in-

37. *American Fruit Growers, Inc. v. Brogdex Co.*, 283 U.S. 1, 11 (1930).

38. *Hartranft v. Wiegmann*, 121 U.S. 609, 615 (1887).

39. 447 U.S. at 308.

40. 447 U.S. at 310. See note 50 *infra*.

41. *Merck and Co. v. Olin Mathieson Chem. Corp.*, 253 F.2d 156, 161-62 (4th Cir. 1958).

capable of degrading hydrocarbons. Through genetic engineering Chakrabarty was able to transfer the plasmids into the host bacteria.⁴² By this process he produced bacteria, which previously had no capability to degrade oil, with the capacity to degrade four different hydrocarbons. This strain of new and different bacteria had an increased usefulness as compared with the original, unmodified strain of naturally occurring bacteria. Therefore, the new bacteria complied with the traditional definition of manufacture.

In other words, the Court could have reached its desired result—allowing Chakrabarty's patent application—by merely following its previously established tests. Instead the Court chose to reach that result by introducing a new test. In this sense the Court's action can be labeled unnecessary. Furthermore, the introduction of the new *Chakrabarty* test raises questions about the continued validity of some case law in the area of patents.

One example of such a question is illustrated in *American Fruit Growers, Inc. v. Brogdex Co.*⁴³ In this case, Brogdex Company patented a method for the preparation of oranges for market by impregnating the orange rinds with a solution of borax sufficient to render them resistant to decay. American Fruit Growers, Inc. challenged the validity of that patent. Reasoning that borax-impregnated oranges were not found in nature, the Third Circuit Court of Appeals found that the oranges could be classified as manufactures and upheld the patent.⁴⁴ Under the test followed in *Chakrabarty*, a finding that the borax-impregnated oranges were not found in nature would have made them patentable under section 101. However, on appeal the Supreme Court held that this position was not tenable, adding that although a manufacture implied a change, not all changes are manufactures;⁴⁵ something more is necessary.⁴⁶ The Supreme Court in *American Fruit* was following the reasoning of one of its earlier cases, *Hartranft v. Wiegmann*,⁴⁷ in which certain sea

42. Patent Application of Ananda M. Chakrabarty (June 7, 1972), reprinted in Petitioner's Brief for Certiorari app., 40-77.

43. 35 F.2d 106 (3d Cir. 1929), rev'd, 283 U.S. 1 (1930).

44. *Id.* at 108. "The complete article is not found in nature and is thus an article of manufacture." *Id.* Compare the Supreme Court's statement in the instant case that Chakrabarty's "discovery is not nature's handiwork, but his own; accordingly it is patentable subject matter under § 101." 447 U.S. at 310.

45. *American Fruit Growers, Inc., v. Brogdex Co.*, 283 U.S. 1, 11 (1930).

46. *Id.* at 12.

47. 121 U.S. 609 (1886).

shells that had been cleaned by acid were held not to be manufactures for purposes of an import duty. In adapting the *Weigmann* definition of a manufacture to patent law, the *American Fruit* Court stated that to constitute a manufacture “[t]here must be a transformation; a new and different article must emerge ‘having a distinctive name, character or use.’”⁴⁸ Accordingly, the *American Fruit* Court held that a change in the oranges sufficient to make them manufactures had not occurred. They remained oranges “fit only for the same beneficial uses as theretofore.”⁴⁹ However, the oranges would have been held to be patentable under the *Chakrabarty* test because they were products of human ingenuity that had characteristics markedly different from those of oranges found in nature.⁵⁰

A second category of patentable subject matter is compositions of matter. Such compositions have been defined as the mixture of two or more ingredients that may include “all composite articles, whether they be the results of chemical union, or of mechanical mixture, or whether they be gases, fluids, powders or solids.”⁵¹ In the instant case the Court adopted this definition, but, as with the definition of a manufacture, did not directly apply it. The Court instead determined that because the bacteria were not products of nature they could be considered combinations of matter.⁵² However, there was no need for the Court to focus on the “product of nature” distinction in finding the *Chakrabarty* bacteria to be compositions of matter. Under the traditional definition, the bacteria were certainly compositions of matter. They were a composition of two substances, the cell mass of the host bacteria and the four plasmids. The combi-

48. 283 U.S. at 13 (quoting *Hartman v. Wiegmann*, 121 U.S. at 615).

49. *Id.* at 12.

50. The test the Court applied in *Chakrabarty* is set forth in 447 U.S. at 310. Before applying that test and holding that the bacteria were patentable, the Court quoted the *American Fruit-Wiegmann* test: “respondent’s micro-organism plainly qualifies as patentable subject matter. His claim is not to a hitherto unknown phenomenon, but to a nonnaturally occurring manufacture or composition of matter—a product of human ingenuity ‘having a distinctive name, character [and] use.’” *Id.* at 309-10 (citation omitted). However, the test the Court applied in *Chakrabarty* is set forth later in the opinion, after this unsupported conclusion. After contrasting the bacteria in *Chakrabarty* with those in *Funk*, the Court held that *Chakrabarty* had “produced a new bacterium with markedly different characteristics from any found in nature and one having the potential for significant utility. His discovery is not nature’s handiwork, but his own, accordingly it is patentable subject matter under § 101.” *Id.* at 310 (emphasis added).

51. 447 U.S. at 308 (quoting *Shell Dev. Co. v. Watson*, 149 F. Supp. 279, 280 (D.D.C. 1957)).

52. 447 U.S. at 310.

nation of the cell mass and the plasmids resulted in a composite article. Thus, the traditional definition was met and the product of nature analysis was unnecessary.

Even though an invention fits the literal definition of a manufacture or a composition of matter, it is not automatically entitled to patent protection. In *Parker v. Flook*,⁵³ the Supreme Court stated that an invention that was merely the discovery of a law of nature could not be patented even if it met the other patent requirements.⁵⁴ This rule excludes, for example, phenomena of nature, mental processes and abstract intellectual concepts.⁵⁵ However, it is important to note that the unpatentability of a discovery of a law of nature does not preclude the patentability of all products of nature. For example, naturally occurring chemical compounds have long been held to be patentable.⁵⁶ Since bacteria are composed of naturally occurring chemicals, it can be argued, bacteria should likewise be patentable. However, a major difference exists between naturally occurring chemicals and naturally occurring bacteria; the bacteria are alive and the chemicals are not. For example, vitamin B-12 is a naturally occurring chemical, but it is not alive.⁵⁷ On the other hand, the bacteria in *Funk* were products of nature that were alive.⁵⁸ Because the only difference between naturally occurring chemicals and naturally occurring bacteria is the absence or presence of life, the effect of life on patentability becomes an important consideration.

53. 437 U.S. 584 (1978).

54. *Id.* at 589.

The holding [in *Gottschalk v. Benson*, 409 U.S. 63 (1972)] that the discovery of that method [of converting binary-coded decimal numbers into pure binary numerals] could not be patented as a "process" forecloses a purely literal reading of § 101 [footnote omitted]. Reasoning that an algorithm, or mathematical formula is like a law of nature, *Benson* applied the established rule that a law of nature cannot be the subject of a patent.

Id.

"Inventions which are literally one of the four categories mentioned in § 101 are not patentable if they are also phenomena of nature because the public must not be deprived of any rights that it theretofore freely enjoyed." *Id.* at 583 n.15.

55. *Id.* at 589.

56. See, e.g., *Merck & Co. v. Olin Mathieson Chem. Corp.*, 253 F.2d 156 (4th Cir. 1958)(vitamin B-12); *Parke-Davis & Co. v. H.K. Mulford Co.*, 189 F. 95 (S.D.N.Y. 1911), *aff'd*, 196 F. 496 (2d Cir. 1912)(adrenalin); *Kuehmsted v. Farbenfabriken of Elberfeld Co.*, 179 F. 701 (7th Cir.), *cert. denied*, 220 U.S. 622 (1910)(aspirin).

57. *Merck & Co. v. Olin Mathieson Chem. Corp.*, 253 F.2d 156, 161-62 (4th Cir. 1958).

58. 333 U.S. 127 (1948).

The Court addressed the issue of the effect of life on the patentability of bacteria only in the context of the plant Acts. The Court held that neither the 1930 nor 1970 plant Act resolved the issue of whether the *Chakrabarty* bacteria are unpatentable because they are alive. The persuasiveness of the Court's opinion could have been strengthened, however, by noting several facts. First, the history of the Plant Patent Act of 1930 shows that Congress did not then consider whether living things in general were patentable.⁵⁹ Secondly, it was not even the fact that plants were alive that caused Congress to believe plants were not patentable under the existing patent statute. Congress believed that because plants were products of nature they could not be "inventions"; for the same reason it believed their developers could not be "inventors" as defined in the patent statute.⁶⁰ Congress accordingly determined that plants were not patentable.⁶¹ To remove this obstacle Congress amended the patent statutes. Section 4884 of the Revised Statutes was amended to "avoid any doubt as to the scope of protection that a patent of this kind would give the patentee . . . because the word 'make' in the statute [was] usually understood to mean the construction by human activity whereas plants [were] reproduced by growth."⁶² Section 4886, the core of the new legislation,

59. The legislative history of the 1930 plant Act contains only two references to patent protection for animals. Both are contained in short, offhand remarks, neither of which was the center of discussion at the time it was made. "[Col. Francis W. Parker] felt that some day the patent law would be amended so as to give the man who developed new forms of plant or animal life an opportunity to control reproduction." *Plant Patents: Hearings on H.R. 11372 Before the Comm. on Patents*, 71st Cong., 2d Sess. 4 (1930)(letter from Edward A. Rumeley). "This is establishing a precedent to provide for a patent to those who develop a rare species of cattle or chickens." 72 CONG. REC. 8,391 (1930) (remarks of Rep. Stafford). It is interesting to note that on April 1, 1969, an application for a patent on a chicken was filed in the Patent Office. *In re Merat*, 519 F.2d 1390 (C.C.P.A. 1975). The patent examiner denied the application solely on the basis of section 101. The POBA affirmed, adding that there was also a violation of section 112, the description requirement. The CCPA affirmed solely on the basis of section 112 saying that the claims did "not particularly point out or *distinctly* claim the subject matter of appellant's invention" as required by 35 U.S.C. § 112 (1976). *Id.* at 1391, 1396 (emphasis in original).

60. *Plant Patents: Hearings on H.R. 11372 Before the Comm. on Patents*, 71st Cong., 2d Sess. 6 (1930)(letter from Thomas E. Robertson, Commissioner of Patents); H.R. REP. No. 1129, 71st Cong., 2d Sess. 7-10 (1930).

61. *Patent Law Revision: Hearings on S. 2, S. 1042, S. 1377, S. 2164, S. 2597 Before the Subcomm. on Patents, Trademarks, and Copyrights of the Comm. on the Judiciary*, 90th Cong., 2d Sess., part 2, 790 (1968)(statement of Donald G. Daus).

62. *Plant Patents: Hearings on H.R. 11372 Before the Comm. on Patents*, 71st Cong., 2d Sess. 7 (1930)(letter from Thomas E. Robertson, Commissioner of Patents).

explicitly provided for plant patents.⁶³ Section 4888 was amended to remove the difficulty of describing plants "in such full, clear, concise and exact terms" as the patent law demanded.⁶⁴ Congress also added a section authorizing the President to direct the Secretary of Agriculture to provide assistance to the Commissioner of Patents to facilitate the administration of the other provisions of the 1930 Act.⁶⁵

The Supreme Court also found that the Plant Variety Protection Act of 1970 did not preclude microorganisms from patent protection under 35 U.S.C. section 101. However, the Court failed to fully examine two important facts that would have more strongly supported this finding: (1) the 1970 Act was not a *patent* law, and (2) the 1970 Act protected only *sexually* reproducing plants.

The Court incorrectly stated that the Plant Variety Protection Act of 1970 extended *patent* protection to sexually reproducing plants.⁶⁶ Although Congress contemplated extension of patent protection to sexually reproducing plants, it never took any action to enact such legislation.⁶⁷ Subsequently, Congress enacted the Plant Variety Protection Act of 1970, which required the Department of Agriculture to issue "certificates of protection" for sexually reproducing plants.⁶⁸ Thus, the 1970 Act provided protection "along the lines of or similar to [the protection] under the patent law,"⁶⁹ but it was not a patent law and it did not "alter protection currently available within the patent system."⁷⁰

In addition, the 1970 Act was limited to sexually reproducing plants; fungi, bacteria and first generation hybrids were specifically excluded from its protection.⁷¹ The Court postulated that Congress had made this specific exclusion for one or more of three possible reasons: (1) by 1970 artificial true-to-type reproduction of sexually reproducing plants was possible, (2) bac-

63. *Id.* at 6.

64. *Id.* at 7.

65. *Id.* at 1, 2, 6, 7.

66. 447 U.S. at 313. "By 1970, however, it was recognized . . . that patent protection was . . . appropriate. The 1970 Act extended that protection." *Id.*

67. S. REP. No. 91-1246, 91st Cong., 2d Sess. 3 (1970).

68. 7 U.S.C. §§ 2402-585 (1976).

69. 116 CONG. REC. 40,296 (1970)(remarks of Rep. Kleppe).

70. S. REP. No. 91-1246, 91st Cong., 2d Sess. 3 (1970).

71. 7 U.S.C. § 2402(a) (1976).

teria were not considered plants by courts of law⁷² or (3) the Patent Office had already issued patents on bacteria.⁷³ However, the Court failed to note other facts that would have provided a sounder basis for the Court's conclusion that the 1970 Act did not affect the patentability of bacteria under the patent laws. Congress did indicate that it excluded hybrids because they have "built-in" protection,⁷⁴ but did not indicate the reason for the exclusion of fungi and bacteria from the 1970 Act.⁷⁵ The Court viewed this omission as a mere failure by Congress to focus on the particular issue before the Court. However, the Court failed to note the simple fact that the reproductive process of bacteria is asexual.⁷⁶ Therefore, bacteria would have been excluded from the 1970 Act because they do not reproduce sexually. Moreover, the fact that bacteria are excluded from the 1970 Act—a non-patent law designed to protect only sexually reproducing plants—cannot bar the patentability of those bacteria under the patent statute.

In addition to addressing the specific arguments advanced before the Court against the patenting of living things based on the Plant Patent Act of 1930 and the Plant Variety Protection Act of 1970, the Court should have addressed directly the basic, underlying argument that living things should be unpatentable because they are alive and that a patent on a living thing would be a patent on life itself. The Court implicitly rejected this argument when it found that the *Chakrabarty* bacteria were patentable despite the fact that they were alive, but the Court's reasoning would have been clearer and more persuasive if it had addressed the problem directly. For example, the opinion's per-

72. *In re Arzberger*, 112 F.2d 834 (C.C.P.A. 1940).

73. 447 U.S. at 314 & n.9. "Patents are granted on cultures [of bacteria]." S. REP. No. 932, 86th Cong., 1st Sess. 7 (1959) (letter from Robert C. Watson, Commissioner of Patents). The Patent Office also has a special classification for patents on bacteria. Class 435 is titled "Chemistry: Molecular Biology and Microbiology." The title of subclass 243 of class 435 is "Microorganisms Per Se, E.G., Protozoa, Etc." PATENT OFFICE, CLASSIFICATION MANUAL 435-4 (1979).

74. *A Bill to Provide Plant Variety Protection: Hearings Before the Patent Subcomm. on Patents, Trademarks and Copyrights of the Comm. on the Judiciary*, 90th Cong., 2d Sess. part 2, 643 (1968) (statement of Floyd Ingersoll).

75. H.R. REP. No. 91-1605, 91st Cong., 2d Sess. 6, 7; S. REP. No. 91-1138, 91st Cong., 2d Sess. 7, reprinted in [1970] U.S. CODE CONG. & AD. NEWS 5082, 5088.

There is some evidence that Congress has viewed bacteria and fungi as nearly synonymous: "The term 'fungus' means any non-chlorophyll-bearing thallophyte . . . as for example, . . . bacteria . . ." 7 U.S.C. § 136(k) (1976).

76. W. KEETON, BIOLOGICAL SCIENCE 714 (2d ed. 1972).

suasive strength could have been increased by making an important but elusive distinction: life and living things are not synonymous. Life is the label affixed to the set of properties that are unique to living things. Life is the "energy of function"⁷⁷ within every living thing, the one component of a living thing that separates it from nonliving things.⁷⁸ Life can also be said to be a product of a nature.⁷⁹ Since life is something man cannot manufacture, it is unpatentable.⁸⁰ Life is, therefore, a unique, unpatentable component of all living things. It is a principle of patent law, however, that "the invention set forth in a claim [must] be construed as a whole."⁸¹ The idea that a claim can be dissected and that a single unpatentable component of the claim can cause the entire claim to become unpatentable has been specifically rejected.⁸² Thus, although the life component of a genetically altered microorganism is not itself patentable, its presence in the microorganism cannot make the new microorganism as a whole unpatentable.

Whether a live, genetically altered microorganism is patentable subject matter under 35 U.S.C. section 101 is one of the most important decisions ever presented to a court. Unfortunately, rather than strengthening the traditional test for patentability to be applied to manufactures and compositions of matter, the Court's decision unnecessarily altered the traditional test by focusing on a finding that the invention was not a product of nature. The Court could have strengthened and clarified the test by applying the traditional definitions of the categories of patentable subject matter more precisely and by examining more closely the legislative history of the plant Acts and the

77. *United States v. 24 Live Silver Black Foxes*, 1 F.2d 933, 933 (W.D. Wash. 1924).

78. E. WILLSON, *LIFE ON EARTH* 8 (1973).

79. "[W]e have no direct evidence concerning the origin of life. We cannot be sure how life did arise; we can only gather indirect evidence to show how it could have arisen and how it probably arose." W. KEETON, *supra* note 76, at 692.

80. Life is obviously not a machine, manufacture, or composition of matter. It might qualify as a process, "a mode of treatment of certain materials to produce a given result," if the materials are food, water and other essentials for maintaining life, and the result produced is the living organism. However, the fatal argument against the patentability of life is that life is not new. See *Merck & Co. v. Olin Mathieson Chem. Corp.*, 253 F.2d 156, 162 (4th Cir. 1958).

81. *In re Chatfield*, 545 F.2d 152, 158 (C.C.P.A. 1976), *cert. denied*, 434 U.S. 875 (1977).

82. *Id.* See also *Parker v. Flook*, 437 U.S. 584, 590, 593-94 (1977); *Makay Radio & Telegraph Co. v. Radio Corp. of America*, 306 U.S. 86, 94 (1939); *Eibel Process Co. v. Minnesota & Ont. Paper Co.*, 261 U.S. 45, 64-65 (1923); *Tilghman v. Proctor*, 102 U.S. 707, 729 (1880).

possible effect life as a component of the invention could have on patentability. Such an analysis would have made the Court's reasoning more forceful and would have given its decision the strong support of precedent and of the established principles of patent law.

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