Diamond v. Chakrabarty: Living Things as Statutory Subject Matter

A great deal of cant is talked about the mystery of life, as if life were somehow more mysterious than the rest of Nature . . . Life is neither more nor less mysterious than is the attraction of the magnet, the density of a paving-stone, or the colour of a tie: Our presence in the midst of Nature's achievements does not affect her estimate of them. She prices all her wonderful goods at the same value, like the stock of a sixpence-half penny bazaar, nothing under, nothing over: She makes them all out of the one stuff, constructing it with a grain of sand, a drop of water, a microorganism, or a nerve cell, all with equal ease.

—S. Paget, Confession Medici (1908)

An object may possess many properties. It may be magnetic. It may be very dense. It may have a particular color. Or, it may be alive. Whether life is somehow more significant than other properties an object may possess has become an issue of increasing social and legal importance.

Recently, the United States Supreme Court had the opportunity to decide whether the living nature of an invention is of legal consequence in determining its patentability. In a five to four decision, the Court held that a genetically engineered living microorganism is patentable subject matter. In reaching this conclusion, the Court specifically found that the microorganism constituted a "manufacture" or "composition of matter" within the meaning of the Federal Patent Act and that the claims relating to the microorganism were not directed to a product of nature or a natural phenomena. The Court denied that the passage of the 1930 Plant Patent Act and the 1970 Plant Variety Protection Act demonstrated a congressional intent to exclude living things from patent protection. In addition, the Court found no basis for the argument that a microorganism cannot be patentable subject matter without the express authorization of Congress.

As a result of the Court's decision, an invention which comprises a living organism cannot be denied patent protection because of its animate nature. Moreover, a patentee, who claims a living organism as his invention, will be able to exclude others from making, using, or selling the organism for a period of seven-

5. _ U.S. at _, 100 S. Ct. at 2210.
6. Id. at _, 100 S. Ct. at 2210-11.
After a brief discussion of the background of the case, this note will analyze the issues confronting the Court and the Court's rationale for its decision. Following this analysis, the important implications of the Court's decision will be discussed.

FACTUAL BACKGROUND

On June 7, 1972, Ananda Chakrabarty filed in the U.S. Patent Office a patent application assigned to the General Electric Company. The application pertained to a genetically engineered bacterium which can be employed in degrading oil slicks.

7. Ananda M. Chakrabarty, at the time of his invention, was a microbiologist at the Research and Development Center of General Electric Company. His field of research was cellular genetic engineering. An aspect of this research involved the application of cellular genetic engineering to the problem of aquatic oil spills. In re Bergy, 596 F.2d 968 n. 8 (C.C.P.A. 1979).
9. Chakrabarty's patent application was designated serial No. 260,563 and was filed June 7, 1972. The application was entitled "Microorganism Having Multiple, Compatible, Degradative, Energy-Generating Plasmid and Preparation Thereof." 596 F.2d at 952.
10. Oil is a mixture of hydrocarbonaceous components. There are known bacteria which have the capacity to degrade the various components of oil into simpler substances that they can digest as food. The bacteria can, therefore, be spread on the surface of an oil spill where they will first degrade the oil to simpler components which they then digest. The oil spill is thereby consumed, the bacteria serving in turn as food for aquatic life. U.S. Patent 3,813,316.

Unfortunately, each of the known strains of bacteria was capable of degrading only a particular component of crude oil. Accordingly, treatment of oil spills required mixtures of different bacterial strains, each capable of degrading a different component of the oil. In practice, however, this method proved less than effective due to differing and often incompatible characteristics of the bacterial strains. Id.

In earlier work, Chakrabarty had discovered that the bacteria's ability to degrade a particular oil component is associated with an extrachromosomal element or plasmid, a hereditary unit different than the chromosome of a bacterial cell. He reasoned that if a single bacterium strain could be developed which contained multiple plasmids, each associated with the ability to degrade a different component of oil, the problems resulting from use of multiple bacterial strains would be obviated. Id.

Starting with a bacterium of the genus Pseudomonas, which has no oil degrading abilities, Chakrabarty, by a unique process, transmitted four different plasmids into the cell of the bacterium. Each of the four plasmids had been identified as being associated with an ability to degrade one of the four major components of crude oil. The resulting genetically engineered bacterium proved capable of an accelerated and sustained growth rate when tested on a sample of crude oil.
Chakrabarty's application contained a total of thirty-six claims divided into four groups. The first group contained claims to the genetically engineered bacterium. The second group contained claims pertaining to the inoculum comprising the bacterium. The third group consisted of claims to the method of preparing the bacterium, and the fourth group of claims pertained to an inoculated medium comprising a carrier material and the bacterium.

During prosecution of Chakrabarty's application, the Patent Office Examiner allowed the claims relating to the method of preparing the bacterium and the claims relating to the inoculated medium. However, the Examiner rejected the claims relating to the bacterium and the claims relating to the inoculum on the basis that they pertained to nonstatutory subject matter not within the scope of section 101 of the Patent Act. Specifically, the Examiner found that the rejected claims were directed toward a "product of nature."

On appeal, the Board of Appeals of the Patent Office reversed the Examiner's rejection of the claims to the bacterium and the inoculum. Chakrabarty had thus engineered a single bacterium capable of performing a task previously requiring a mixture of four different bacteria and in so doing eliminated the problems associated with using mixtures of bacteria to eliminate oil spills. Id.

11. Section 112 of the Patent Act sets forth the requirements for a patent specification. Section 112 specifically provides: "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." 35 U.S.C. § 112 (1976).

12. 596 F.2d at 970.

13. In allowing the claims relating to the method of preparing the bacterium and the claims relating to an inoculated medium, the Examiner assured that Chakrabarty would receive a patent on the invention as defined in those claims. Thus, Chakrabarty would have a patent on the method of preparing the bacterium, and an inoculated medium comprising the bacterium and a carrier material. 596 F.2d at 971.

14. Section 101 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.

15. The Supreme Court has held that a "product of nature" is not patentable as a manufacture within the meaning of the patent statutes. In order to be patentable as a manufacture the article must be given a new or distinctive form, quality, or property. See American Fruit Growers, Inc. v. Brogdex, 283 U.S. 1 (1931).
inoculum. The board found that the bacterium was not a product of nature since it was not "naturally occurring." However, the board rejected the claims on a rationale different than that of the Examiner. The board's reason for rejection was that the living nature of Chakrabarty's bacterium excluded it from the scope of statutory subject matter.17

Chakrabarty appealed the decision of the Board, and in In re Chakrabarty, the Court of Customs and Patent Appeals reversed.18 The court held that Chakrabarty's bacterium was not outside the scope of statutory subject matter merely because of its living nature. The court's holding was based on its earlier decision in In re Bergy19 which it found to be controlling.20

16. The board specifically stated:
We agree with the appellant that the claimed bacteria may not be considered as being 'products of nature' simply because from the record we must conclude that Pseudomonas bacteria containing two or more different energy generating plasmids are not naturally occurring.
596 F.2d at 971.

17. The Court of Customs and Patent Appeals (CCPA) found that the Board of Appeals erroneously believed that the Examiner had given two grounds for rejection: one, the claimed bacterium was a product of nature; and two, the claims were directed to living organisms. The CCPA found the Examiner's rejection to be based on ground one only and that ground two resulted from the board misreading the Examiner's answer. Id.


20. Malcolm E. Bergy filed patent application serial No. 477,766 on June 10, 1974 relating to a method of producing the antibiotic lincomycin utilizing a biologically pure culture of the microorganism Streptomyces vellosus. The application contained claims relating to the process for preparing the antibiotic which the Patent Office Examiner allowed; however, a claim relating to the biologically pure culture was rejected on the basis that the culture was a "product of nature" (see note 15 supra) and was, therefore, not statutory subject matter within the meaning of 35 U.S.C. § 101. Id. at 1033.

On appeal, the Patent Office Board of Appeals affirmed the Examiner's rejection. However, the board disregarded the Examiner's basis for the rejection and substituted a completely new ground for rejection based on the living nature of the microorganism. Id.

The decision of the board was appealed, and the Court of Customs and Patent Appeals reversed. The CCPA held that: one, the biologically pure culture did not exist in, is not found in, and is not a product of nature; two, there is no reason to deprive the inventor of patent protection merely because the invention is alive; and three, the claim is directed to statutory subject matter and should not have been rejected on the ground that it relates to a living organism. Id. at 1035-38.
Following the CCPA's decision in Chakrabarty, the Government filed a petition for certiorari. The petition, however, was dismissed\textsuperscript{21} since the CCPA had vacated its ruling in Chakrabarty for reconsideration with its earlier decision in Bergy. The CCPA's decision in Bergy had been vacated and remanded by the Supreme Court\textsuperscript{22} for further consideration in light of the recent decision in Parker v. Flook.\textsuperscript{23}

On remand, the CCPA, after reviewing the Supreme Court's opinion in Flook,\textsuperscript{24} affirmed its earlier decisions in Chakrabarty and Bergy.\textsuperscript{25} The court held that the living nature of the claimed bacteria did not preclude their patentability. The court specifically found the bacteria to be "manufactures" or "compositions of matter" within the scope of statutory subject matter set forth in section 101.\textsuperscript{26} Moreover, the court stated, its decision was not an extension of the patent laws.\textsuperscript{27}

\textsuperscript{23} 437 U.S. 584 (1978). Flook involved an attempt to patent a process for updating alarm limits in which the only novel step was an improved method of calculation. In rejecting the claim to the process, the Court held that a method of calculation is not within the scope of statutory subject matter as defined in section 101, even though a value resulting from the method of calculation is used in a specific process step. \textit{Id.} at 595 n. 18.

At the conclusion of its opinion the Court indicated that the judiciary "must proceed cautiously when asked to extend patent rights into areas wholly unforeseen by Congress." \textit{Id.} at 596.

The Court continued quoting with approval from the majority opinion in Deepsouth Packing Co. v. Laitram Corp., 406 U.S. 518 (1972):

\begin{quote}
[\textit{W}e should not expand patent rights by overruling or modifying our prior cases construing the patent statutes, unless the argument for expansion of privilege is based on more than mere inference from ambiguous statutory language. We would require a clear and certain signal from Congress before approving the position of a litigant who, as respondent here, argues that the beachhead of privilege is wider, and the area of public use narrower, than the courts had previously thought. No such signal legitimizes respondent's position in this litigation.]
\end{quote}

437 U.S. at 596.

\textsuperscript{24} It should be noted that in remanding the Supreme Court did not indicate what aspect of Flook it thought relevant to the issues in Bergy. Parker v. Bergy, 438 U.S. 902 (1978).
\textsuperscript{25} In re Bergy, 596 F.2d 952 (C.C.P.A. 1979).
\textsuperscript{26} \textit{See} note 14 \textit{supra}.

\textsuperscript{27} The CCPA indicated that its decision was no more than an interpretation of section 101 in a case of first impression. As a question of first impression, no precedent was overruled, and, accordingly, the court's decision was no more than "normal judicial function." 596 F.2d at 987.
Following the CCPA's affirmance in *Bergy*, the Government again filed petition for certiorari. The petition was granted October 29, 1979. Subsequent to the Supreme Court granting certiorari, Bergy cancelled all the claims relating to bacteria from his patent application. As a result, Bergy's motion to dismiss for mootness was granted January 14, 1980.

**Analysis of the Court Opinion**

The question before the Supreme Court was whether Chakrabarty's bacterium comprises patentable subject matter within the scope of section 101 of the Federal Patent Act. The question, therefore, was one of statutory interpretation requiring the Court to determine the scope of patentable subject matter intended by Congress in section 101 and to decide if the bacterium fell within the terms defining statutory subject matter.

Four issues confronted the Court in its analysis of the scope of patentable subject matter. The first issue was whether the bacterium fell within the terms defining statutory subject matter in section 101. The second issue was whether the claims to the bacterium were directed to a product of nature or a natural phenomena which are not patentable. The third issue was whether the passage of the 1930 Plant Patent Act and the 1970 Plant Variety Protection Act demonstrated a congressional intent to exclude living things from the scope of patentable subject matter. The fourth issue was whether microorganisms could qualify as patentable subject matter without the express authorization of Congress.

In holding that Chakrabarty's bacterium was patentable subject matter, the Court found the bacterium to fall within the terms

30. See note 14 **supra**.
31. See note 15 **supra**.
32. The Supreme Court has held that patent claims directed to natural phenomena are not patentable. See note 54 **infra**.
34. 7 U.S.C. § 2402(a) (1976).
35. This argument was advanced by the Government. _ _ U.S. at _, 100 S. Ct. at 2209.
36. This was the Government's second argument. In making this argument, the Government relied on that portion of the Supreme Court's decision in *Flook* which quoted *Deepsouth Packing Co.* See note 23 **supra**.
of section 101 and held that the claims were not directed to a product of nature or a natural phenomena. The Court rejected the argument that passage of the 1930 and 1970 Plant Acts demonstrated the intent of Congress to exclude living things from the scope of section 101. The Court also rejected the argument that microorganisms could not qualify as patentable subject matter without express authorization of Congress.

Section 101 sets forth the categories of patentable inventions. The categories are processes; machines; manufactures; compositions of matter; and new and useful improvements in processes, machines, manufactures, or compositions of matter. Accordingly, to be patentable, the bacterium must fall within one of these statutory categories.87

In determining the category of inventions into which Chakrabarty's bacterium falls, the categories of "processes" and "machines" can be immediately excluded as possibilities. A "process" is an operation performed by rule to produce a desired result,88 and a "machine" is an apparatus or instrument.89 In no sense can the bacterium be considered "an operation", and the bacterium's living nature precludes it from being an apparatus or an instrument which are inanimate by nature. Therefore, in order for the bacterium to be patentable subject matter within the terms of section 101, the bacterium must be a "manufacture" or a "composition of matter."40

In determining whether Chakrabarty's bacterium fell within the terms defining statutory subject matter, the Court focused on these latter categories. The Court defined "manufacture" as "the production of articles for use from raw materials prepared by giving the material new forms, qualities, properties, or combinations whether by hand or labor."41 The Court defined "composition of matter" as "all composites of two or more substances . . . and all composite articles, whether they be the results of chemical union or of mechanical mixture or whether they be fluids, powders, or solids."42

37. 1 A. DELLER, DELLER'S WALKER ON PATENTS § 13 (2d ed 1964).
38. Id. at § 15.
39. Id. at § 16.
40. In order for the bacterium to be patentable as an improvement in a "manufacture" or "composition of matter" the bacterium itself would have to constitute a "manufacture" or "composition of matter." Id. at § 19.
42. 1 A. DELLER, DELLER'S WALKER ON PATENTS §§ 14, 55 (1st ed. 1939).
Given the Court’s definitions of “manufacture” and “composition of matter”, Chakrabarty’s bacterium could arguably qualify as patentable subject matter under either category of invention. By giving an organism new biological functions through genetic engineering, it might be argued that Chakrabarty has produced an article from raw materials by giving those materials new qualities or properties. Thus, Chakrabarty’s bacterium would be a “manufacture” under the Court’s definition. Alternatively, the bacterium in its simplest form is no more than a composite of atoms held together by chemical bond. Characterized as such, the bacterium would constitute a “composition of matter” by the Court’s definition. The terms of section 101, therefore, seem broad enough to encompass Chakrabarty’s bacterium as statutory subject matter under either category as defined by the Court.

Reviewing the policy underlying the patent laws, the Court was persuaded that the terms defining statutory subject matter were indeed broad enough to encompass the bacterium. The Court noted that the Constitution gave Congress the power to promote the development of new technology through the granting of patents43 and that Congress created the patent laws so that society would benefit by the advancement of technology.44 The patent laws, therefore, were intended for the benefit of society and not that of the individual patentee.45 Thus, if society is to benefit fully from the patent laws, statutory subject matter should be broadly interpreted in order to encompass many new types of technology.

43. U.S. Const. art. I., § 8, cl. 8 provides in part: “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.” This clause confers Congress with the power to provide for copyrights and patents, the copyright law arising from congressional power to promote the progress of science and the patent law arising from congressional power to promote the useful arts. The word “science” meant all knowledge and learning and was related to writings and authors. See generally, 1 A. DELLER, DELLER’S WALKER ON PATENTS § 10 (2d ed. 1964).

44. However, Justice Brennan, writing for the dissent, quoting Deepsouth Packing Co., pointed out that the patent laws are a balance between the need to promote progress and our society’s aversion to monopolies. A patentee is given the exclusive right to prevent others from making, selling, or using his invention for a period of seventeen years and this right is often characterized as a monopoly. (See 35 U.S.C. § 154). — U.S. at —, 100 S. Ct. at 2213.

45. Thomas Jefferson expressed the view that intellectual property did not stem from a natural rights theory. He viewed the patent system as a method of inducing an inventor to disclose his discovery so that society might benefit from new knowledge. Graham v. John Deere Co., 383 U.S. 1, 8-9 (1966).
such as Chakrabarty's bacterium.

Furthermore, a review of the history of the Patent Act helped the Court to reach the same ultimate conclusion. The Patent Act of 1793, authored by Thomas Jefferson, defined statutory subject matter as "any new and useful art, machine, manufacture, or composition of matter, or any new or useful improvement on any art, machine, manufacture, or composition of matter." The 1793 Act was broadly drafted in order to liberally encourage invention. Subsequent acts embodied substantially the same definition. The Patent Act of 1952 (presently in force) maintains this same definition with slight variation in section 101. The scope of section 101 has been said to include "anything under the sun that is made by man." Thus the definition of statutory subject matter has remained substantially the same for 187 years and has been interpreted to encompass many new technologies without statutory amendment. The history of section 101 seems to clearly support

46. The Patent Act of 1793 was drafted by Thomas Jefferson, himself an avid inventor, and his views on the patent system as originally conceived have been given much weight by the Supreme Court in the past. His own belief was that invention should be liberally encouraged, and, as draftsman for the Act of 1793, he had active influence on its content. Id. at 7-8.

47. Act of Feb. 21, 1793, ch. 11, § 1, 1 Stat. 318 (repealed 1836).

48. See note 46 supra.


50. See note 2 supra. In section 101 the term "process" has taken the place of the term "art." However, in section 100 the term "process" is defined as meaning "process, art or method." See 35 U.S.C. § 100 (1976).

51. This was the language used to describe the scope of section 101 by P. J. Federico, one of the draftermen of the 1952 Act, in testimony before the House Judiciary Committee. See Patent Law Codification and Revision: Hearing on H.R. 3760 before Subcommittee No. 3 of the House Committee on the Judiciary, 82d Cong., 1st Sess. 37 (1951). This same language was incorporated into the House and Senate reports on the bill which became the Patent Act of 1952. See H.R. Rep. No. 1923, 82d Cong., 2d Sess. 5 (1952); S. Rep. No. 1979, 82d Cong., 2d Sess. 6 (1952).

52. The variety of inventions patented over the past 187 years is astounding.
the Court’s view that Chakrabarty’s bacterium falls within the
terms defining statutory subject matter.

Notwithstanding the fact that the bacterium was found to fall
within the terms of section 101, the Court noted that the bacte-
rium would not be patentable subject matter if it was a “product
of nature” or if the claims to the bacterium were directed to a
“natural phenomena.” Since the Patent Office Board of Appeals
had previously held that the bacterium was not a “product of na-
ture,” the Court focused on whether Chakrabarty’s claims to the
bacterium were directed toward a natural phenomena.

In order to resolve this issue, the Court contrasted
Chakrabarty’s invention with that of the patentee in Funk Broth-
ers Seed Co. v. Kalo Inoculant Co. In Funk, the patentee’s
claims, which were directed to a mixture of naturally occurring
root-nodule bacteria, were held invalid. Justice Douglas, writing
for the majority, reasoned that the patentee had only discovered
that certain strains of known bacteria could be mixed without the bac-
teria exhibiting mutually inhibiting effects and that this was no
more than the discovery of a law of nature. Justice Douglas em-
phasized that the strains of bacteria constituting the mixture took
on no new form or utility and that the bacteria functioned inde-

53. See note 15 supra.

54. The Supreme Court has held laws of nature unpatentable based on the
rationale that the laws of nature are for the use of everyone and not for the exclu-
sive use of a patentee. See generally, Parker v. Flook, supra, note 19; Gottschalk
v. Benson, 409 U.S. 63 (1972) (claims directed to a method of converting binary-
coded decimal numbers to binary numbers); Funk Bros. Seed Co. v. Kalo Inocu-
lant Co., infra note 56; O’Reilly v. Morse, 56 U.S. (15 How.) 62 (1853) (claims
directed to use of electric current for printing characters at a distance); LeRoy v.
Tatham, 55 U.S. (14 How.) 156 (1852) (claims directed to a machine for making
pipe).

55. See note 16 supra.

56. 333 U.S. 127 (1948). In Funk, the patentee had discovered that certain
naturally occurring strains of root-nodule bacteria are not mutually inhibiting. By
selection and testing he developed mixed cultures of these bacteria for use as ni-
trogen fixing agents for plants. The fact that the cultures comprised mixtures of
bacterium allowed a single culture to be used as a fixing agent for a greater num-
ber of plant types. The Court invalidated the patentee’s claim to the mixed cul-
tures, holding that the claims were directed toward a natural phenomena and,
therefore, not statutory subject matter. Interestingly, no issue was made of the
living nature of the bacteria cultures. Id. at 128-32.
pendent of any effort by the patentee. Justice Douglas, therefore, concluded that the essence of the patentee’s invention, as defined in his claims, was the discovery of a law of nature which is unpatentable subject matter.

In Chakrabarty, however, the Court found the invention unlike that of the patentee in Funk. The Court noted that Chakrabarty had produced a bacterium having different characteristics from other bacteria occurring in nature. The bacterium was, therefore, unlike the mixed bacterial strains in Funk which were naturally occurring and which took on no new form or utility. Thus, the Court concluded that Chakrabarty’s invention was not the discovery of a law of nature and that the claims to the bacterium were not directed to a “natural phenomena”.

Thus having determined that the bacterium constituted statutory subject matter, the Court turned to the issue presented by the 1930 Plant Patent Act and the 1970 Patent Variety Protection Act. The Court was unpersuaded that the mere passage of the Acts demonstrated a congressional intent to exclude living things

57. Justice Douglas specifically stated:
Each of the species of root-nodule contained in the package infects the same group of leguminous plants which it always infected. No species acquires a different use. The combination of the six species produces no new bacteria, no change in the six bacteria, and no enlargement of the range of their utility. Each species has the same effect it always had. The bacteria perform in their natural way. Their use in combination does not improve in any way their natural functioning. They serve the same ends nature originally provided and act quite independently of any effort by the patentee.

Id. at 131.

58. Justice Douglas’ opinion in Funk has been criticized for confusing the separate issues of “inventiveness” (now referred to as nonobviousness—see 35 U.S.C. § 103) and of “statutory subject matter.” At least one commentator has questioned whether Funk is still good law. See Guttag, The Patentability of Microorganisms: Statutory Subject Matter and Other Living Things, 13 U. Rich. L. Rev. 247 (1979). However, the Court’s reliance on Funk in Chakrabarty indicates it is still viable precedent.

59. 35 U.S.C. § 161. Section 161 provides: “Whoever invents or discovers and asexually reproduces any distinct and new variety of plant, including cultivated sports, mutants, hybrids, and newly found seedlings, other than a tubar propagated plant or a plant found in an uncultivated state, may obtain a patent therefor . . . .” 35 U.S.C. § 161 (1979).

60. 7 U.S.C. § 2402(a). Section 2402(a) provides: “The breeder of any novel variety of sexually reproduced plant (other than fungi, bacteria, or first generation hybrids) who has so reproduced the variety, or his successor in interest, shall be entitled to plant variety protection therefor. . . .” 7 U.S.C. § 2402(a) (1979).
from the scope of section 101. The Government argued that if section 101 was intended to encompass living things, it would not have been necessary for Congress to enact the 1930 and 1970 Acts in order to provide for the patenting of plants. The Government argued that passage of the Acts was evidence that Congress does not consider living things, such as Chakrabarty's bacterium, to be patentable under section 101.

In order to determine the congressional purpose for enacting the 1930 Plant Patent Act, the Court reviewed the legislative history of the Act. Prior to 1930, two factors were thought to preclude plants from patent protection. The first factor arose from a decision by the Commissioner of Patents in Ex Parte Latimer. In Latimer, the Commissioner had rejected patent claims directed to a component of a pine tree on the basis that the claims were directed to a product of nature and, therefore, were unpatentable subject matter. The Commissioner's holding in Latimer resulted in the general belief that all plants were unpatentable products of nature.

The second factor thought to preclude plants from patent protection was the difficulty involved in formulating a written description of a plant. Many newly developed plants differ from existing plants only in the color of their blossoms or their fragrance. Such distinctions are extremely difficult to describe in writing. However, the patent statutes require that an inventor distinctly claim that

61. 1889 Dec. Com. Pat. 123. In Latimer, the Commissioner of Patents held claims directed to a component of a pine tree not patentable. The component comprised parts extracted from the needles of a particular pine tree. The Commissioner allowed claims to the process of extracting the parts, but in rejecting the claims to the component he stated:

[T]he mere ascertaining of the character or quality of trees that grow in the forest and the construction of the woody fiber and tissue of which they are composed is not a patentable invention, recognized by the statute. . . . The result would be that . . . patents might be obtained upon the trees of the forest and the plants of the earth, which of course would be unreasonable and impossible. . . .

62. See note 15 supra.

63. The origin of the concept that plants were products of nature stemmed from Latimer and two early cases dealing with the patenting of natural phenomena: Morton v. N. Y. Eye Informary, 17 F. Cas. 879 (C.C.S.D.N.Y. 1862) (No. 9865) (discovery that ether can be used as an anesthetic held not patentable); Wall v. Teck, 66 F. 552 (9th Cir. 1895) (discovery that known fumigating agent is more effective when applied at night held not patentable). See Thorne, Relation of Patent Law to Natural Products, 6 J. Pat. Off. Soc'y 23 (1923).
subject matter which is his invention so that his invention may be
distinguished from other known inventions.64 If the only distin-
guishing feature of a newly developed plant is its fragrance, the
inventor will be faced with a difficult task in describing this dis-
tinction in writing.65

The Court found that both factors previously thought to ex-
clude plants from patent protection were addressed by the 1930
Plant Act. The committee reports relating to the act expressed the
view that the work of the plant breeder was in aid of nature.66 The
committee reports thus emphasized that plants developed by a
breeder are the result of the breeder's own work and not an unpat-
entable "product of nature." Furthermore, to overcome the diffi-
culties encountered in describing the plants, the written descrip-
tion requirement was relaxed for plant patents.67 The Court,
therefore, concluded that Congress had passed the 1930 Act in or-
der to overcome the two factors which were thought to preclude
plants from patent protection. As a result, the Court rejected the
Government's argument that passage of the 1930 Act was evidence
that statutory subject matter did not include living things.68

64. The requirement that an inventor distinctly claim his invention is em-
65. During hearings on the 1930 Act, Commissioner of Patents Robertson
testified as to the difficulties of the plant inventor complying with the written
description requirements. Plant Patents: Hearings on H. R. 11372 Before the
House Committee on Patents, 71st Cong., 2d Sess. 7 (1930). His recommenda-
tion of a relaxation of the requirements was adopted and is now embodied in 35 U.S.C.
§ 162. Section 162 provides: "No plant patent shall be declared invalid for non-
compliance with Section 112 of this title if the description is as complete as is
66. The House and Senate reports state:
There is a clear and logical distinction between the discovery of a new
variety of plant and of certain inanimate things, such, for example, as a
new and useful natural mineral. The mineral is created wholly by nature
unassisted by man and is likely to be discovered in various parts of the
country; and, being the property of all those on whose land it may be
found, its free use by the respective owners should of course be permit-
ted. On the other hand, a plant discovery resulting from cultivation is
unique, isolated, and is not repeated by nature, nor can it be reproduced
by nature unaided by man, and such discoveries can only be made avail-
able to the public by encouraging those who own the single specimen to
reproduce it asexually and thus create an adequate supply.
Sess. 6 (1930).
67. See note 65 supra.
68. Justice Brennan, writing for the dissent, was not so ready to dismiss the
Although the Court rejected the Government's argument based on the enactment of the 1930 Act, the Court did note that the legislative history of the Act contained some support for the Government's position. Secretary of Agriculture Hyde, in a letter to the chairmen of the House and Senate committees considering the 1930 Act, indicated that it was his understanding that the patent laws covered "only inventions or discoveries in the field of inanimate nature." Secretary Hyde, therefore, viewed passage of the 1930 Act as necessary since he felt that living things were not patentable under the existing statute. The Court, however, discounted the Secretary's opinion as not authoritative. The Court asserted that the patent laws were outside the expertise of the Secretary of Agriculture, and, therefore, his views as to the scope of patentable subject matter were not convincing.

Having concluded that passage of the 1930 Act did not support the Government's argument, the Court then turned to the legislative history of the 1970 Plant Variety Protection Act in order to determine the congressional purpose for its enactment. The 1970 Act was passed to provide patent protection for sexually reproduced plants. Plants which reproduce sexually had been excluded from the 1930 Act because they were thought not to be reproduc-


70. Commissioner of Patents John Dienner, however, stated that in 1928 he and Secretary Hyde conferred on the possibility of providing legislation granting patent protection for originators of plants and animals. The Commissioner noted that the movement was kidnapped as the 1930 Plant Patent Act. Dienner, *Patents for Biological Specimens and Products*, 35 J. PAT. Off. Soc'y 286 (1953). Given Secretary Hyde's association with Commissioner Dienner, it is difficult to believe that he would not be highly informed on the scope of patentable subject matter.
ble true-to-type through seedlings. The Court, therefore, concluded that the purpose behind the 1970 Act was to provide for patent protection of plants excluded from protection under the 1930 Act. The Court found no evidence that the Act was passed because section 101 did not include living things.

The Court also found no significance in the express exclusion of bacteria from the 1970 Act. The Government had argued that exclusion of bacteria from the 1970 Act indicated that Congress had considered the possibility of providing patent protection for bacteria and had decided against it. The Government reasoned that Congress, therefore, did not consider bacteria statutory subject matter and as a result, Chakrabarty's bacterium should not be patentable.

The Court, however, found two alternative explanations for the express exclusion of bacteria from the 1970 Act. First, the Court pointed out that the exclusion might reflect congressional agreement with the holding in In re Arzberger. In Arzberger, the CCPA held that bacteria were not plants for purposes of the 1930 Act. Therefore, Congress may have agreed with the holding in Arzberger and expressly incorporated it into the 1970 Act. Second, the Court noted that the exclusion might indicate that Congress considered bacteria already patentable under section 101 and hence it was not necessary to include bacteria within the 1970 Act. The Court, therefore, found no significance in the express exclusion of bacteria from patent protection under the 1970 Act.

Notwithstanding the Court's refusal to find significance in

71. In 1930 it was generally believed that newly developed plants could not be reproduced through seedlings and that each successive generation of plants would exhibit different traits. H.R. Rep. No. 1129, 71st Cong., 2d Sess. 4-5 (1930); S. Rep. No. 315, 71st Cong., 2d Sess. 4 (1930).

72. See note 60 supra.

73. 112 F.2d 834 (C.C.P.A. 1940). In Arzberger, the Court held that bacteria are not plants for purposes of the 1930 Plant Act. Id. at 837.

74. See U.S. Patent Nos. 3,923,601; 3,356,574; and 3,364,117 which have all issued since 1967 and which all contain claims directed to living organisms.

75. In disputing the Court's rejection of the significance of the passage of the 1970 Act, Justice Brennan for the dissent argued that the express exclusion of bacteria from the Act indicated a congressional intent that bacteria not be afforded patent protection. Although admitting that the legislative history of the Act was silent as to the exclusion, Justice Brennan insisted that Congress assumed patentable only those animate objects as to which it specifically legislated. He reasoned that bacteria, being expressly excluded from the 1970 Act, must be unpatentable. — U.S. at —, 100 S. Ct. at 2213-14.
Congress' passage of the 1970 Act, the question still remains: Why was it necessary for Congress to pass the 1970 Act? If Congress understood statutory subject matter to include living things, then the plants protected under the 1970 Act would have been patentable under Section 101 and the new statute would be superfluous. Congress, therefore, must have understood that the plants encompassed under the 1970 Act were not statutory subject matter under section 101. This congressional understanding may stem from the fact that plants are living things. Thus, contrary to the Court's conclusion, the passage of the 1970 Plant Variety Protection Act can be interpreted as evidence that section 101 is intended to exclude living things from patent protection.

In addition to rejecting the Government's interpretation of Congress' purpose in enacting the 1930 and 1970 Acts, the Court also rejected the argument that a microorganism cannot qualify as statutory subject matter without express authorization of Congress. In making this argument, the Government relied on the Supreme Court's holding in *Flook* that the judiciary must proceed cautiously in extending patent rights into areas wholly unforeseen by Congress. The Government contended that since genetic technology was unforeseen at the time Congress enacted section 101, the Court should be reluctant to extend patent protection to living organisms which are the products of such technology.

In further support of this argument, the Government warned of the potential dangers which may result from genetic research. The Government urged the Court to consider the potential hazards of genetic research in determining whether Chakrabarty's bacterium was patentable subject matter. The Government argued that in view of the potential dangers, the bacterium could not qualify as statutory subject matter without the express authorization of

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76. See note 23 supra.

77. Justice Brennan, writing for the dissent, agreed with the Government that the Court's holding in *Flook* required caution in extending the patent laws into areas unforeseen by Congress. Justice Brennan indicated that even if he agreed that the 1930 and 1970 Acts were not dispositive, he would still be reluctant to extend patent protection to bacteria given the Court's holding in *Flook*. — U.S. at —, 100 S. Ct. at 2213 n.2.

78. The Government's concern over potential dangers was not unwarranted. In earlier work, Chakrabarty planned to develop a bacterium that was capable of converting sewage sludge and similar wastes to methane gas. He destroyed the bacterium, however, before completing his work because he feared that if ingested by a human, it might cause serious complications in the digestive tract. See Wade, *Dicing With Nature: Three Narrow Escapes*, 195 SCIENCE 378 (1977).
In rejecting the Government's argument, the Court did not dispute the authority of Congress to establish the scope of patentable subject matter. Rather, the Court viewed section 101 as already containing express authorization for finding the bacterium patentable subject matter. The Court stated that the purpose of the patent laws is to promote the progress of the useful arts and that its interpretation of section 101 was commensurate with that policy goal. Therefore, the Court's holding that the bacterium comprised statutory subject matter was the result of statutory interpretation rather than an extension of the patent laws.

79. Congressman Crumpacker (R-Ind.), who actively participated in the hearings on the 1952 Patent Act as a member of the patent subcommittee, stated: When the Courts, in seeking to interpret the language of the Act, go through the ritual of seeking to ascertain the "intent of Congress" in adopting the same they would do well to look to the writings of these men—Federico, Rich, Harris and the others—as they far more than any member of the House or Senate, knew and understood what was intended by the language used.


The "Rich" referred to in the quote by Congressman Crumpacker, is Judge Giles Rich who wrote the opinion for the court in In re Bergy, and it is apparent from his opinion that he believes section 101 encompasses living things. 596 F.2d 952.

Furthermore, it is interesting to note that P.J. Federico, also recognized in the above quote, in a 1937 article on Louis Pasteur's patents expressed the opinion that Pasteur's patent on yeast would probably not be considered statutory subject matter under the Patent Act preceding the 1952 Act. Federico, Louis Pasteur's Patents, 86 Science 327 (1937).

Given the differing views of Judge Rich and Mr. Federico, it appears that even the draftsmen disagree on what was intended by the language used in the 1952 Patent Act.

80. In his dissenting opinion, Justice Brennan, though believing the claims to the bacterium unpatentable, did not dispute that claims relating to the use of the bacterium in a process would be patentable. U.S. at __, 100 S. Ct. at 2212. Moreover, both the majority and dissent agreed that the amount of research that had already been done without assurance of patent protection demonstrated that the course of genetic research would not be changed even if the bacterium was found unpatentable. Id. at __, 100 S. Ct. at 2212. It appears as though both the majority and dissent agreed that at least one part of Chakrabarty's invention, the bacterium's use, would be patentable and that genetic research would continue regardless of whether the bacterium was patentable. It therefore seems that the Court's opinion would have little effect on promotion of the useful arts and that it was not necessary to find Chakrabarty's bacterium patentable in order to achieve the policy goal underlying the patent laws.
The Court also disagreed with the Government's interpretation of *Flook*. The Court stated that *Flook* was a determination that an improved method of calculation is not patentable subject matter even when the method is tied to a specific end use. The Court emphasized that *Flook* did not hold that inventions unforeseen by Congress are unpatentable per se. The Court stated that to hold unforeseen inventions unpatentable would strike at the core concept of the patent law. Such a holding would result in only foreseeable inventions being patentable. In fact, section 103 of the Patent Act requires that an invention be nonobvious in order to be patentable. Therefore, requiring that an invention be foreseeable in order to be patentable conflicts with the concept of non-obviousness embodied in section 103.

Having rejected the Government's interpretation of *Flook*, the Court refused to weigh the potential hazards of genetic research in determining the scope of statutory subject matter for two reasons. First, the amount of genetic research already undertaken persuaded the Court that genetic engineering would continue regardless of its decision. Therefore, even if the Court held Chakrabarty's bacterium to be nonstatutory subject matter, the risk of potential

81. See note 23 supra.

82. In making this statement the Court specifically cited a portion of its opinion in *Graham v. John Deere Co.* in which the Court discussed the requirement that an invention be nonobvious. See *Graham v. John Deere*, 383 U.S. 1, at 12-17 (1966). It is therefore apparent that the "core concept" to which the Court referred is the requirement of nonobviousness embodied in 35 U.S.C. § 103. — U.S. at —, 100 S. Ct. at 2211.

83. Section 103 provides:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the difference between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.


84. The Court's opinion, however, fails to draw a distinction between the foreseeability or the obviousness of an invention and the foreseeability of the area of technology to which the invention applies. It is quite possible to have a non-obvious invention in a foreseeable area of technology. In such a case, restricting patentable subject matter to only those areas of technology foreseen by Congress would not conflict with the requirements of section 103. Therefore, excluding inventions in the area of genetic research, an area of technology unforeseen by Congress, would not conflict with the requirement than an invention be nonobvious.
hazard resulting from genetic research would not be reduced. Second, the factors involved in evaluating the potential hazards of genetic research do not lend themselves to judicial determination. The Court, therefore, concluded that the political branches of the government were the more appropriate bodies to evaluate the potential hazards arising from genetic research. The Court emphasized that its own role was limited to defining the scope of patentable subject matter intended by Congress and, in accordance with this role, found Chakrabarty's invention to be statutory subject matter within the scope of section 101.

**Implications**

As a result of the Court's decision that a genetically engineered microorganism can constitute a "manufacture" or "composition of matter" within the scope of section 101, an invention which comprises a living organism cannot be denied patent protection because it is alive. Moreover, a patentee who claims a living organism as his invention will have the right to exclude others from making, using, or selling the organism for a period of seventeen years.

The right to exclude others from making, using, or selling a patented organism affords the inventor a broader scope of protection than does the right to exclude others from making, using, or selling a patented process utilizing the organism. Had the Court decided that a living microorganism was unpatentable subject matter, an inventor who had developed a new microorganism and a new process utilizing the microorganism would only be able to claim the new process as his invention. If a new use was found for the inventor's microorganism, he would not be able to exclude others from making, using, or selling his microorganism for purposes of that new use. By contrast, if the inventor is able to claim the microorganism as his invention, he may exclude others from making, using, or selling the microorganism regardless of its use. Accordingly, the Court's decision that living things are patentable

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85. 35 U.S.C. § 154 defines the rights of a patentee. Section 154 provides:

> Every patent shall contain a short title of the invention and a grant to the patentee, his heirs or assigns, for the term of seventeen years, subject to the payment of issue fees as provided for in this title, of the right to exclude others from making, using, or selling the invention throughout the United States, referring to the specification for the particulars thereof. A copy of the specification and the drawings shall be annexed to the patent and be a part thereof.

subject matter will enable inventors of living organisms to secure broad protection for their inventions through the patent system.

Given the broad protection now afforded living inventions as a result of the Court's decision, the question arises whether there are any limitations on the patentability of higher life forms. This question was addressed by the CCPA in In re Merat.86 Merat involved an application for a patent on a novel method of cross-breeding chickens. The application contained a number of claims, one of which pertained to a chicken when produced by the novel method of cross-breeding. The Patent Office rejected the claim to the chicken on two grounds: first, the claimed chicken was not a manufacture within the scope of section 101, and second, the patent applicant had failed to distinctly claim that which he regarded as his invention as required by section 112.87 The CCPA affirmed the rejection of the claim on the basis of section 112, but did not address the rejection based on section 101.

In Merat, the novel method of breeding called for the mating of a "normal" rooster with a dwarf hen. The CCPA, however, found that the application contained no adequate definition of what constituted a "normal" rooster. As a result, there was no way to distinguish those chickens produced by the novel method of cross-breeding from those that were not. The patent application had, therefore, failed to comply with the requirements of section 112.88

As demonstrated by the patent applicant's failure to comply with section 112 in Merat, the problem encountered by the inventor in patenting higher organisms is defining his invention in precise enough terms so that it may be distinguished from known life forms. Therefore, even though a higher organism may be statutory subject matter on the authority of the Court's decision in Chakrabarty, the requirements of section 112 may still present a limiting force to its patentability.

Despite the difficulties involved in the patenting of higher life forms, the opponents of genetic research have vowed to continue their battle against the patenting of living things in Congress. In particular, the Peoples Business Commission, a public interest group, has called the Supreme Court's decision in Chakrabarty an attack on life, and has appealed to the American people to speak

86. 519 F.2d 1390 (CCPA 1975).
87. See note 11 supra.
88. 519 F.2d at 1396.
out against the decision through their elected officials. Further congressional consideration of the patentability of living organisms is therefore a distinct possibility.

CONCLUSION

The Court has presented a valid interpretation of the scope of statutory subject matter set forth in section 101. By interpreting the statute in a broad manner, the Court has attempted to promote the advancement of technology which is the underlying policy goal of the patent laws. As a result of the Court’s broad interpretation, the inventors of novel organisms will be able to procure broad protection for their inventions.

Notwithstanding the Court’s decision in Chakrabarty, the requirement of section 112 of the Patent Act still presents a potential limitation to the patenting of higher life forms. However, despite this limitation, the Chakrabarty decision is certain to result in a great deal of lobbying and political activity by the opponents of genetic research seeking to restrict the patentability of living things. While future congressional action in this area seems predictable, the course such action will take is not. Since Chakrabarty is a case of statutory interpretation, its future may be less than secure. Congress may seek to legislatively overrule the decision in accordance with the Government’s interpretation of the scope of patentable subject matter.

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