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Reexamining Intellectual Property Concepts: A Glimpse into the Future through the Prism of Chakrabarty

Monroe E. Price
Benjamin N. Cardozo School of Law, price@yu.edu

REEXAMINING INTELLECTUAL PROPERTY CONCEPTS: A GLIMPSE INTO THE FUTURE THROUGH THE PRISM OF *CHAKRABARTY*

MONROE E. PRICE*

I. INTRODUCTION

In the last several years, a new generation of legal scholars has seen it as their duty to take on various components of the regular way of looking at things. Their swath has been wide, but so far, the subject of intellectual property has been safe as a target. Perhaps this is a tribute to the thoroughness of the work of Professor Melville Nimmer[1] and the monumentality of his achievement. Perhaps it is because in the world of legal education, copyright scholars, except for the very few such as Professor Nimmer, do not hold the political positions as kings of the academic mountain necessary for fulfillment of the inevitable assault by the young.

There is reason for a reexamination of the doctrinal bases of intellectual property law. Professor Nimmer brilliantly organized the copyright law in his articles and treatises. His carefulness gave security to the idea that the legal regime which evolved over the last two centuries rested on firm footing. As a consequence, little that has been written during the last several decades has jarred the fundamental preconception that the patent and copyright law as we know it—the prevailing method of protecting property rights in products of the mind—is justified.[2] Yet we need to know whether our faith in historic assumptions is deserved since intellectual property doctrines are playing an increasingly important role in controlling information distribution in the formation of the new technology, and as a result, in the nature of international competition. Our society has become one

* Dean, Benjamin N. Cardozo School of Law, Yeshiva University. The author acknowledges the assistance of Lucy Eisenberg, Gregory Stone, and Lester Levy of Munger, Tolles and Olson in earlier drafts of this Essay.

[1] Professor Nimmer was the author's colleague and mentor at U.C.L.A. Price, *Government Policy and Economic Security for Artists: The Case of the Droit de Suite*, 77 YALE L.J. 1333 (1968) (study on resale rights for artists). This Essay was written as part of a research project headed by Professor Nimmer. The author also collaborated with Professor Nimmer in a study of the *droit moral* for the College Art Assocation.

[2] *See, e.g.*, Breyer, *The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies and Computer Programs*, 84 HARV. L. REV. 281 (1970).

in which much of the potential for wealth lies in such intangibles as computer programs, databases, information processing, genetic engineering, and music and art. An ever smaller and decreasing proportion of the nation's wealth remains in the manufacture and exploitation of traditional inventions such as mousetraps, locomotives, and clothespins.

It may turn out that products of the mind need more extensive protection to invigorate more creativity. Or, perhaps, there are other ways that are more fruitful—a greater role for subsidy and government sponsorship of research, for example, with more access to the fruits of publicly financed inquiry. What is important is that there are underlying assumptions in current law and doctrine about the sources of creativity and productivity. Assumptions that seem more and more in favor of the extension of property rights, and if successfully disputed, would question much of the justification for the system of copyright and patent law for the system which now exists.

This essay is far from a wholesale effort to question intellectual property scholarship or doctrine. Rather, in this tribute to Professor Melville Nimmer and his work, I use a single case and problem to identify some of the issues that might be raised in a lengthy treatment of the subject. The vehicle is a case decided by the United States Supreme Court several years ago, *Diamond v. Chakrabarty*.[3] In this case the Court was required to answer the question of whether invented organisms that otherwise met the standards for patentability would be excluded from protection because they were living. Since the case is an outstanding example of the availability of alternative doctrinal aides to reach competing results, both the majority and dissenting opinions expose a set of political and economic expectations about how a line of judicial development is thought to affect patent protection and the development of technology in our society.

II. *DIAMOND V. CHAKRABARTY*

Ananda M. Chakrabarty, a microbiologist employed by the General Electric Company, sought to create a bacterium which would be useful in the control of oil spills.[4] Oil is made up of many components, and no single strain of naturally occurring bacterium is capable of degrading more than one component. The various bacteria needed to break down all the components

[3] 447 U.S. 303 (1980).
[4] *Id.* at 305.

of an oil spill, however, are mutually inhibiting and could not be naturally combined.[5]

Chakrabarty discovered that the oil degradation capabilities of certain bacteria are controlled by plasmids[6]—units of DNA that exist within a bacterial cell and are separate from the main chromosome. Using this information, he invented a process of transferring up to four different plasmids, each capable of degrading a different component of oil into a single strain of *Pseudomonas aeruginosa*—a bacterium which has no oil-degradation capability of its own.[7] The new "hybrid" bacterium is capable of breaking down oil into simpler substances which then serve as food for aquatic life.[8]

Next, Chakrabarty explored the question of how best to introduce his bacterium into the area of the oil spill. Straw was selected as the ideal carrier, because it could serve a double func-

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[5] [S]ince bacterial strains differ from one another in a) their rates of growth on the various hydrocarbon components, b) nutritional requirements, production of antibiotics or other toxic material, and c) requisite pH, temperature and mineral salts, the use of a mixed culture leads to the ultimate survival of but a portion of the initial collection of bacterial strains. As a result, when a mixed culture of hydrocarbon-degrading bacteria are deposited on a[n] oil spill the bulk of the oil often remains unattacked for a long period of time (weeks) and is free to spread or sink.

Application of Bergy, 596 F.2d 952, 969 (C.C.P.A. 1979). The court of Customs and Patent Appeals decided Chakrabarty's appeal together with an appeal brought by Malcolm E. Bergy who also sought to patent a microorganism.

[6] *Chakrabarty*, 447 U.S. at 305 n.1. A plasmid has been defined as a hereditary unit that is

> physically separate from the chromosome of the cell . . . .
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> Plasmids are believed to consist of double-stranded DNA (deoxyribonucleic acid) molecules. The genetic organization of a plasmid is believed to include at least one replication site and a maintenance site for attachment thereof to a structural component of the host cell.

Bergy, 596 F.2d at 969.

[7] *Chakrabarty*, 447 U.S. at 305 n.1.

[8] *Bergy*, 596 F.2d at 969. Chakrabarty described the invention as follows:

> The GEO [genetically engineered organism] has been constructed as a genetically improved strain by transferring to the PC [parental cell organism] genetic materials from other microorganism(s), each of which has the capability for degrading a different component of crude oil. The genetic materials are transferred in the form of plasmids, which become physically incorporated into the cellular structure of the PC. . . .
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> Once stabilized, not only is the plasmid-supplied genetic material tolerated by the PC, but a mutual cooperation results. Thus, at the direction of the plasmid, the PC operates its protein-generating machinery to produce hydrocarbon-degrading enzymes, which are completely new within the cellular environment of the PC. This provides to the PC a new capability for degrading one or more crude oil components depending upon the number of plasmids transferred.

Brief for Petitioner app. Parker v. Chakrabarty, Diamond v. Chakrabarty, 447 U.S. 303 (1980) (No. 79-136) (Declaration of Chakrabarty, at 85, 86 (April 5, 1974)) [hereinafter Brief for Petitioner].

tion as a transporter, as well as an oil absorbent.[9] The straw was to be impregnated with an inoculum composed of the Chakrabarty-created, freeze-dried bacteria and dropped from the air onto the oil spill as soon as possible after the accident.[10] This new technology promised greater speed and efficiency in controlling oil spills[11] than was possible using existing methods, and thus was of tremendous potential value to the oil industry and to the inventor.

In 1972, Chakrabarty applied for patent protection. His thirty-six claims fell into three basic categories: first, he sought to patent the process used in producing the bacteria; second, he sought protection for the combination of innoculum and the carrier material—straw; and third, he sought to patent the bacterium itself.[12] The patent office allowed Chakrabarty's claims for the first two categories but rejected the claims for the third.[13] The patent examiner explained that the bacteria were not patentable under the applicable laws. "[I]t is considered that applicants [sic] Pseudomonas differ at best in degree rather than in kind from other Pseudomonas. In any case, it is considered that the instant Pseudomonas is drawn to a thing occurring in nature that is substantially unaltered and thus nonstatutory subject matter."[14] After a tortuous journey,[15] Chakrabarty's Pseudonomas came

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9 *Bergy*, 596 F.2d at 970.

10 *Id.*

11 *Chakrabarty*, 447 U.S. at 305 n.2.

12 *Chakrabarty*, 447 U.S. at 305-06. The United States Court of Customs and Patent Appeals (C.C.P.A.) claimed that the patent draftsman divided the claims into four major categories: (1) the process; (2) the inoculum and carrier together; (3) the inoculum alone; and (4) the bacteria per se. Finding that the inoculum alone was identical to the bacterium except that the inoculum is in a freeze-dried state, the last two claims were rejected as unpatentable subject matter. *Bergy*, 596 F.2d at 970-71.

13 *Chakrabarty*, 447 U.S. at 306.

14 Brief for Petitioner, *supra* note 8, app. H at 166a (letter of the Examiner, Jan. 11, 1974). The Patent Board of Appeals claimed that the examiner had rejected the claims to the bacteria per se on two grounds: first, that they are "products of nature" and therefore not patentable; and second, that "[t]hey are drawn to live organisms" and are not patentable subject matter under the Patent Act of 1952, 35 U.S.C. § 101 (1982 & Supp. IV 1986). Brief for Petitioner, *supra* note 8, app. G at 159a (Opinion and Decision of Board of Patent Appeals, May 20, 1976). In fact, the second ground, that the bacteria are "alive", was not presented by the examiner as a ground for rejection. Rather, he wrote that the strains in question were "drawn to a thing occuring in nature" and hence unpatentable. Brief for Petitioner, *supra* note 8, app. H at 166a. For all intents and purposes, the Board of Appeals reversed the examiner's decision by holding that the bacteria were not products of nature and technically affirmed his decision on a second self-manufactured ground; that living things are not patentable. Brief for Petitioner, *supra* note 8, app. G at 163a. This is the issue that finally came before the Supreme Court.

15 Chakrabarty appealed the Patent Board of Appeals denial of his claim to the Court of Customs and Patent Appeals. The C.C.P.A. reversed based upon its decision in *In re* Bergy, 563 F.2d 1031 (1977), where it found a microorganism to be eligible for patent

before the Court. In a five to four decision, the Court interpreted section 101 of the Patent Act[16] to allow patent protection for genetically-engineered living organisms.[17]

III. Judicial Self-Doubt and Beyond

A. The Treatment of Patentability by the Supreme Court Prior to the 1970's

Chakrabarty reached the Supreme Court at a time of great judicial uncertainty regarding the extent to which the products of American scientific research were entitled to patent protection.[18] The debate over the patentability of living organisms was but one manifestation of a more pervasive concern regarding highly technological areas. Prior to *Chakrabarty*, the controversy had centered on the patentability of algorithmic[19] and computer based processes that were the fruits of extraordinary research efforts of the last quarter century.[20]

In both the genetic and computer areas, two distinct judicial philosophies emerged. In *Parker v. Flook*,[21] the debate of the older majority of the Court reflected a recognition of judicial shortcomings. The Justices sensed that they were in an environment of advanced technology where they could not foresee the consequences of their actions. These Justices expressed their un-

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protection. Shortly thereafter, the Court vacated *Bergy*, 438 U.S. 902 (1978), and remanded it for reconsideration. Consequently, before reconsidering the case the C.C.P.A. vacated *Chakrabarty* as well and consolidated it with *Bergy* for reconsideration. The Court reaffirmed both of its prior decisions. Subsequently, *Bergy* was dismissed as moot, 444 U.S. 1028 (1980), before *Chakrabarty* was argued in March, 1980, 447 U.S. at 306-07 (1980).

16 The Patent Act of 1952, 35 U.S.C. § 101 (1982) states that:

> 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.

17 *Chakrabarty*, 447 U.S. at 303. The Court pronounced:

> Congress is free to amend § 101 so as to exclude from patent protection organisms produced by genetic engineering. . . . Or it may choose to craft a statute specifically designed for such living things. But, until Congress takes such action, this Court must construe the language of § 101 as it is. The language of that section fairly embraces respondent's invention.

Id. at 318.

18 The struggle was about the adaptability of the patent process itself and about the differences of opinion between the Patent and Trademark Office, on the one hand, and the Court of Customs and Patent Appeals on the other. For an historical discussion of the adaptability of the patent laws to recent technological advancements, see Diamond v. Diehr, 450 U.S. 175, 194-205 (1981) (Stevens, J., dissenting).

19 *See infra* note 35.

20 *See Diehr*, 450 U.S. at 194-205; Parker v. Flook, 437 U.S. 584, 595 (1978).

21 *Parker*, 437 U.S. at 584 (the "old" majority consisted of Justices Brennan, Stevens, White, Marshall, Blackmun and Powell).

certainty in terms of an impulse toward restraint and deference to Congressional guidance. Although underlying their caution, there may have been a concern about the extension of property rights in a zone where free exchange of information is thought desirable.[22]

By contrast, the new majority of the Court in *Diamond v. Diehr*[23] viewed these questions of patentability as a challenge. These Justices saw themselves and the judicial process as having a role in adapting a 19th-century statute to an age of microprocessors and genetically engineered bacteria.[24]

Patent law cases have always provided wide latitude for judicial interpretation because of the elusive quality of the patentability concept.[25] In *Funk Bros. Seed Co. v. Kalo Inoculant Co.*,[26] the Court held invalid as a "work of nature" a patent for a mixture of six naturally occurring bacteria which did not inhibit each other and could thus be used as a broad-acting plant vaccine.

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[22] Justice Brennan wrote that, "[g]iven the complexity and legislative nature of this delicate task, we must be careful to extend patent protection no further than Congress has provided." *Chakrabarty*, 447 U.S. at 319 (Brennan, J., dissenting). "It is the role of Congress, not this Court, to broaden or narrow the reach of the patent laws. This is especially true where, as here, the composition sought to be patented uniquely implicates matters of public concern." *Id.* at 322.

Similarly, Justice Stevens, speaking for the majority, in *Parker v. Flook*, wrote that, "[i]t is our duty to construe the patent statutes as they now read, in light of our prior precedents, and we must proceed cautiously when we are asked to extend patent rights into areas wholly unforeseen by Congress." *Parker*, 437 U.S. at 596. Justice Stevens then quoted Justice White's statement in *Deepsouth Packing Co. v. Laitram Corp.*:

> "[U]nless the argument for expansion of privilege is based on more than mere inference from ambiguous statutory language[, w]e would require a clear and certain signal from Congress before approving the position of a litigant who . . . argues that the beachhead of privilege is wider, and the area of public use narrower, than courts had previously thought.

406 U.S. 518, 531 (1972).

[23] 450 U.S. 175, 176 (1981) (the "new" majority consisted of Justices Rehnquist, Burger, Stewart, White and Powell). Justices Brennan, Stevens, Marshall and Blackmun, who were in the "old" majority in *Parker*, switched to the dissent in *Diehr*. Similarly, Justices Rehnquist, Burger and Stewart, who made up the "new" majority, had dissented in *Parker*.

[24] The majority in *Chakrabarty* consisted of Justices Burger, Rehnquist, Stewart,—who were also in the majority in *Diehr*—Blackmun and Stevens. Justices Brennan, Marshall, White and Powell constituted the dissent in *Chakrabarty*.

This expansive view of patentability was articulated by Justice Rehnquist. "[I]n dealing with the patent laws, we have more than once cautioned that courts 'should not read into the patent laws limitations and conditions which the legislature has not expressed.'" *Diehr*, 450 U.S. at 182 (citing *Chakrabarty*, 447 U.S. at 308 (quoting United States v. Dubilier Condenser Corp., 289 U.S. 178, 199 (1933))).

[25] Section 101 of the Patent Act defines what is patentable subject matter. The invention must be "new and useful," and fall into one of the five categories listed above. Once the claimed invention meets the standards for patentability under section 101, but before the patent is issued, the invention must also meet the novelty requirement of section 102, and non-obviousness requirement of section 103. *See Parker*, 437 U.S. at 600 (Stewart, J., dissenting).

[26] 333 U.S. 127 (1948).

> Those qualities are of course not patentable[, f]or patents cannot issue for the discovery of the phenomena of nature . . . . The qualities of these bacteria, like the heat of the sun, electricity, or the qualities of metals, are part of the storehouse of knowledge of all men. They are manifestations of laws of nature, free to all men and reserved exclusively to none. He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end.[27]

Even in *Chakrabarty*, where the Supreme Court was seen by many, including the dissenting Justices, as crossing the line,[28] the existence of a zone of unpatentability was recognized. "[A] new mineral discovered in the earth or a new plant found in the wild is not patentable subject matter," wrote Chief Justice Burger. "Likewise, Einstein could not patent his celebrated law that $E=mc^2$; nor could Newton have patented the law of gravity. . . . [L]aws of nature, physical phenomena, and abstract ideas have been held not patentable."[29] This notion of some "protected ground" has been articulated in various ways. "A principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right."[30] More recently, the Court has stated that "[p]henomena of nature, though just discovered, mental processes, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work."[31]

These notions, these formulae of words, these tests of patentability, which at one time seemed so useful, have proven chimerical as the Court confronts the more puzzling products of advances in science and engineering.[32] Clearly, courts have never been able to define what is and what is not a product of nature. One problem with the traditional test is that our conceptions of "nature" are continuously modified by scientific progress. Since modern science has

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27 *Id.* at 130 (citations omitted). But as Justice Frankfurter remarked in his concurring opinion:

> It only confuses the issue . . . to introduce such terms as "the work of nature" and the "laws of nature." For these are vague and malleable terms infected with too much ambiguity and equivocation. Everything that happens may be deemed "the work of nature," and any patentable composite exemplifies in its properties "the laws of nature."

Funk Bros., 333 U.S. at 134-35 (Frankfurter, J., concurring).

28 *See Chakrabarty*, 447 U.S. at 318, 322 (Brennan, J., dissenting).

29 *Chakrabarty*, 447 U.S. at 309.

30 Le Roy v. Tatham, 55 U.S. (14 How.) 156, 175 (1852).

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

32 *See supra* note 22.

succeeded in manipulating the genetic composition of living cells, the living cell no longer exists as a purely natural structure. As the number of claimed inventions which crowd upon the zone of dispute increases, and as science intervenes in the realm of nature with even greater sophistication, the shortcomings of a limitation on patentability based upon "nature" become more and more apparent.

These novel cases posed by the new technology illustrate this point. It is hard to distinguish the *Funk Bros.* case from *Chakrabarty* except in the most primitive and mechanical ways. The inventor in *Funk Bros.* was trying to create a vaccine in which already existing bacteria, clearly products of nature, would be combined in a way that did not cause inhibition.[33] In *Chakrabarty,* the inventor sought to combine naturally existing plasmids into a new bacterium so as to cause the desired degradation of oil.[34]

Similarly, problems of definition and coping with language and distinctions, have arisen in the Court's treatment of algorithms where the paradigm shifts from skepticism to the creation of property rights.[35] Here, too, one sees the change from caution and competition to protection and the creation of property.

B. The Shift in the Treatment of Patentability by the Supreme Court Since the 1970's

In 1972, the Court declared unpatentable a method for converting a binary number using a digital computer.[36] The Court reasoned that the resulting patent would yield a monopoly in an idea, and that "the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself."[37] Just nine years later, in *Diamond v. Diehr*,[38] a closely divided Court affirmed the granting of a patent for a process of curing rubber which relied heavily on the use of the Ar-

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[33] Justice Douglas, speaking for the *Funk Bros.* Court, stated that the mere grouping together of bacterial strains which then continue to carry out their own naturally created tasks was not "an invention or discovery within the meaning of the patent statutes." 333 U.S. at 132.

[34] Chief Justice Burger distinguished the invention in *Chakrabarty*, from the invention in, *Funk Bros.* "Here, by contrast, the patentee has produced a new bacterium with markedly different characteristics from any found in nature . . . . His discovery is not nature's handiwork, but his own." *Chakrabarty*, 447 U.S. at 310.

[35] The Court has defined an algorithm as "[a] procedure for solving a given type of mathematical problem." Gottschalk v. Benson, 409 U.S. 63, 65 (1972). The Court refused to broaden this definition to include "[a] defined process or set of rules that leads and assures development of a desired output from a given input." Diamond v. Diehr, 450 U.S. 175, 186 n.9 (1981).

[36] Gottschalk v. Benson, 409 U.S. 63 (1972).

[37] *Id.* at 72.

[38] 450 U.S. 175 (1981) (5-4 decision).

rhenius equation.[39] Over a sharp dissent by Justice Stevens, in which he contended that the Court was improperly extending protection,[40] the majority stated that the patentees were not preempting the equation, but merely foreclosing others from using it in conjunction with additional steps in their claimed processes.[41]

The purpose of the above is not to suggest where the proper line should be drawn in defining patentability, or to conclude whether the product of nature test is a proper method for determining the availability of patent protection.[42] Rather, the point is that the division in the Court in these cases evidenced deep concerns about the shape of intellectual property doctrine and disclosed widely disparate perspectives on the role such doctrine should play in spurring creativity.

The question arises as to whether the Court of the 1970's in *Parker v. Flook*,[43]—another case concerning the patentability of a process which employs an algorithm,[44]—"must [have] proceed[ed] cautiously when . . . asked to extend patent rights into areas wholly unforeseen by Congress."[45] The Court claimed that when expanding on ambiguous statutory language, the Court should "require a clear and certain signal from Congress before approving the [patent]."[46] Why did this tentative view—this

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[39] Named after its discoverer, Svante Arrhenius, the equation had long been used in the process of curing rubber. *Id.* at 177 n.2. The claimed innovation, however, was the continuous input of the equation variables (e.g., temperature) into a programmed digital computer. The computer would then calculate the exact point at which the rubber was properly cured and automatically open the press. Prior to this, all calculations were done by hand and the operator could only approximate the point at which the rubber was ready. The petitioner claimed that the process was new and useful, and more efficient than the earlier hit-or-miss method. *Id.* at 175-81.

[40] *Diehr*, 450 U.S. at 193 (Stevens, J., dissenting).

[41] *Id.* at 187.

[42] *See id.* at 175; *Chakrabarty*, 447 U.S. at 303.

[43] 437 U.S. 584 (1978).

[44] The petitioner in *Parker* sought to patent a method of updating "alarm limits" during catalytic chemical conversion of hydrocarbons. An "alarm limit" is essentially a number which, when reached, signals the presence of danger or inefficiency in one of the process variables. The petitioner's claimed invention used an unpatentable mathematical formula (an algorithm) in a "new" method of recalculating the appropriate alarm limit during the different phases of production. Justice Stevens, speaking for the Court, rejected the claim because it "[did not] purport to contain any disclosure relating to the chemical processes at work, the monitoring of process variables, or the means of setting off an alarm or adjusting an alarm system. All that it provides is a formula for computing an updated alarm limit." 437 U.S. at 586. The Court thus found that the invention was not patentable subject matter under 35 U.S.C. § 101 (1982).

[45] 437 U.S. at 596.

[46] *Id.* (quoting Deepsouth Packing Co. v. Laitrum Corp. 406 U.S. 518, 531 (1972)). The Court took an equally strong position in its prior landmark patent decision, Gottschalk v. Benson, 409 U.S. 63 (1972), stating that the decision to extend the patent laws to new fields is one that Congress must make.

search for congressional guidance—reappear in only the dissent of *Chakrabarty*? There, Justice Brennan wrote:

> The patent laws attempt to reconcile this Nation's deep-seated antipathy to monopolies with the need to encourage progress. . . . Given the complexity and legislative nature of this delicate task, we must be careful to extend patent protection no further than Congress has provided. In particular, were there an absence of legislative direction, the courts should leave to Congress the decisions whether and how far to extend the patent privilege into areas where the common understanding has been that patents are not available.[47]

The composition of the majority of the Court had shifted, and with it, basic attitudes shifted as well. The language of the Court itself reflected this change. In the 1970's, the Court spoke of drawing the line between what is properly the property of the public—a principle or product of nature—and what is patentable as an invention—a law of nature applied to a new and useful end.[48]

In the 1980's doubts about the consequences, and the need for congressional direction are less evident. In *Chakrabarty*, the new majority of the Court interpreted vague statutory language in positive terms authorizing action and not encouraging restraint. "Broad general language is not necessarily ambiguous when congressional objectives require broad terms."[49] Former Chief Justice Burger recited history in a way that supports this breadth of interpretation. Thomas Jefferson, he pointed out, drafted the Patent Act of 1793 to embody Jefferson's philosophy that "ingenuity should receive a liberal encouragement."[50] As a result, patentability was extended broadly to "any new and useful *art*, machine, manufacture, or composition of matter, or any new or useful improvement thereof."[51] When Congress substituted the word "process" for the word "art" in 1952,[52] it declared that patents can issue for "anything under the sun that is made by man" provided that the other standards of pat-

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> If these [computer] programs are to be patentable, considerable problems are raised which only committees of Congress can manage, for broad powers of investigation are needed, including hearings which canvass the wide variety of views which those operating in this field entertain.

Id. at 73.

47 *Chakrabarty*, 447 U.S. at 319 (Brennan, J., dissenting) (citations omitted).

48 *Parker*, 437 U.S. at 584.

49 *Chakrabarty*, 447 U.S. at 315.

50 *Chakrabarty*, 447 U.S. at 308 (quoting letter from Thomas Jefferson to Oliver Evans (May 2, 1807), *reprinted in* 11 THE WRITINGS OF THOMAS JEFFERSON 200-02 (A. Bergh rev. ed. 1907) (Washington ed. 1871)).

51 The Plant Patent Act of 1930, ch. 312, § 4886, 46 Stat. 376 (codified as amended at 35 U.S.C. § 101 (1982 & Supp. IV 1986) (emphasis added)).

52 35 U.S.C. § 101 (1982) (note on history and revision).

entability are met.[53]

Chakrabarty was thus an additional strong signal that we have moved from a Supreme Court characterized by doubt and restraint to a Court far more ready to include the fruits of new research within the realm of patent protection. Instead of seeking congressional guidance—as in the 1970's[54]—the Court has now taken the lead in defining the degree of intellectual property protection available in a new world of biotechnological research. The Court has challenged Congress, in order to exclude from patent protection organisms produced by genetic engineering.[55]

This shift did not occur because the Court was wiser or more scientifically proficient. Nor had there not been intervening signals from Congress that extending patent protection to these sensitive new areas was desirable. Instead, the Court's shift reflected an attitude favoring the creation of property rights in products of the intellect as the best means to stimulate research that "push[es] back the frontiers of chemistry [and] physics" and thereby benefits mankind.[56] In *Chakrabarty* and other difficult patent cases of the last few years, there is a motif to the prevailing opinions, not always well articulated, but nonetheless quite significant. These opinions call on the theology of property law and, in an adaptive way, to the notion that by granting transferable property rights, courts will cause a more efficient allocation of resources.

This shift to the *Chakrabarty* analysis suggests that assumptions about underlying economic forces may be more important than allegiance to legal doctrine as a guide to understanding fundamental intellectual property decisions. The approach also introduces for debate what those assumptions that underlie patent law should be in a way that has hardly been adequately fulfilled.

This form of analysis leads to some distinctly "un-Nimmer" like ways of looking at statutes. Rather than attempt a careful analysis of the preceding cases, harmonizing and distinguishing them based on text and available aids to statutory construction, an economic model is constructed with economic rights serving as the building blocks for the model. Richard Posner's well-known theory that judicial decisions concerning private disputes should conform to the dictates of economic efficiency[57] is extended more than implicitly to the

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[53] S. REP. No. 1979, 82d Cong., 2d Sess. 5 (1952); H.R. REP. No. 1923, 82d Cong., 2d Sess. 6 (1952).

[54] *See supra* note 22.

[55] *See supra* note 17.

[56] *Chakrabarty*, 447 U.S. at 316 (quoting Great Atl. & Pac. Tea Co. v. Supermarket Equip. Corp., 340 U.S. 147, 154 (1950)).

[57] R. POSNER, ECONOMIC ANALYSIS OF LAW 495 (1986); *see generally* F. GOLLADAY, ECO-

realm of judicial decisions concerning public statutory law.

Frank Michelman has described this move in a useful essay that can be used to illuminate the process of reasoning in the *Chakrabarty* opinion.[58]He has attacked the historical

> categorical opposition, deep-rooted in our legal culture, between enacted ("positive") and common (judge-made) law. In this opposition it is common law that is usually perceived as the organic carrier of elemental, popular morality, the morality that goes without saying, whereas enacted law is taken to reflect specific dictates of deliberate policy or of particularistic formations of power. . . . It is preeminently the common law, the judge-made law, for which investigators claim to have documented an economic "implicit logic" or "basic character," which might in some way reflect an organic or consensual popular will. Far from expecting any economizing tendency in statute-based law, the theory offers reasons for *not* expecting any . . . .
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> [But] if there really is abroad in society a preference for efficient institutions strong enough to inspire self-interested judges to produce efficient common law, a like inspiration should be detectible in judicial interpretations of certain parts of constitutions and certain classes of statutes.[59]

Michelman's thesis that efficiency is an apt way to approach judicial interpretation of statutes may be particularly convincing where patent statutes and other intellectual property laws are in question. Judge Posner, himself, has used patent law adjudication to demonstrate what he perceives to be the weakness of other modes of justification for reaching a judicial decision.

> I know that many lawyers and judges find the language of economics repulsive. Yet the policies that have given shape to the patent statute are quintessentially economic, and the language of economics is therefore the natural language in which to articulate the test for obviousness. And, with all due respect, I do not think the majority has succeeded very well in articulating an alternative test.[60]

In the first part of this passage Judge Posner's claim is that the

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NOMIC 2223-25 (1978); J. LINDAUER, ECONOMICS-A MODERN VIEW 75-76 (1977); M. SPENCER, CONTEMPORARY ECONOMICS 479-81 (2d Ed. 1971).

58 Michelman, *Constitutions, Statutes, and the Theory of Efficient Adjudication*, 9 J. LEGAL STUD. 431 (1980).

59 *Id.* at 432-33.

60 Roberts v. Sears, Roebuck & Co., 723 F.2d 1324, 1347 (7th Cir. 1983) (en banc) (Posner, J., concurring in part and dissenting in part).

patent statute is itself based upon economic policies.[61] However, he then seems to argue that judges should use the langugage of economics in interpreting the statute, at least *faute de mieux*.[62] These are two distinct arguments, which Posner elides by suggesting that precisely because the statute advances economic goals, the language of economics serves as the natural, perhaps the only suitable, language for interpreting the statute. There is a difference between acknowledging that economic considerations have always played an important role in patent policy and the philosophy of embracing a jurisprudence devoted almost exclusively to the advancement of economic goals. At this point, we should recall Michelman's distinction between enacted positive law and judge-made common law.

To be sure an examination of the legislative history surrounding past patent legislation demonstrate that economic considerations, have always played an important role in the development of patent laws. The grant of a patent—a special type of property right—is intended to stimulate invention and investment. An example of the incentives that patents supply may be seen in the history of the Plant Patent Act of 1930[63]—legislation necessary to provide patentability for asexually produced hybrid plants. In the deliberations leading to the passage of that Act, much was made of the purported manuscript of Luther Burbank in which he wrote:

> I have been for years in correspondence with leading breeders, nurserymen, and Federal officials and I despair of anything being done at present to secure to the plant breeder any adequate returns for his enormous outlays of energy and money. A man can patent a mousetrap or copyright a nasty song, but if he gives the world a new fruit that will add millions to the value of earth's annual harvests he will be fortunate if he is rewarded by so much as having his name connected with the result. Though the surface of plant experimentation has thus far been only scratched and there is so much immeasurably important work waiting to be done in this line I would hesitate to advise a young man, no matter how gifted or devoted, to adopt plant breeding as a life work until America takes some action to protect his unquestioned rights to some benefit from his achievements.[64]

This is a familiar strain in most discussions of patent legislation

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61 *Id.*

62 *Id.* (*faute de mieux* means adopted or undertaken for the lack of something better).

63 The Plant Patent Act of 1930, ch. 312, 46 Stat. 376 (codified as amended in scattered sections of 35 U.S.C.).

64 H.R. REP. No. 1129, 71st Cong., 2d Sess. 2 (1930) (Rep. Purcell quoting from telegram received from widow of Luther Burbank).

including not only those leading to the proceedings of the 1930 Act but also the 1970 Plant Variety Protection Acts[65] and the arguments made to the Court by industry representatives in the *Chakrabarty* case.[66] The economic justification for patent protection is almost always based on the necessity of providing an incentive for invention. At the same time, the traditional view has held that there were sound economic reasons for limiting the scope of patentability. In the words of Judge Posner, "[a] patent enables its owner to monopolize the production of the things in which the patented idea is embodied,"[67] and monopoly power can have deleterious effects on social welfare by reducing the availability of useful products and increasing the cost to consumers. Traditional patent policy, then, provides a difficult area of the law for theorists. The basic premise that awarding property rights maximizes social utility conflicts in some way with the "darker side" of patents as a type of private property invested with monopoly power.[68]

IV. Future Implications of the *Chakrabarty* Decision: Should It Be Interpreted Broadly or Narrowly?

The issue is whether continued reliance on the validity of assumptions about the extension of property rights provides the large scale answer to the intellectual property debates of the future. *Chakrabarty* marked the turn toward an explicit recognition and reliance on efficiency as a guide to interpretation. It represented a new mode of looking at the way in which patent law should be defined, and a new posture of the Court, as opposed to Congress, in enlarging the scope of patentability. There are some systemic difficulties with the new view, the property-creating approach of *Diehr*[69] and *Chakrabarty*.[70] One difficulty is the inherent notion that the creation of property rights, or at least the expansion of the patent law in the protectable products of the mind, will ultimately cause an efficient result in the world of science and ideas by encouraging initial investment and subsequent transfers in the marketplace. Superficially, this approach follows

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65 Plant Variety Protection Act of 1970, Pub. L. No. 91-577, 84 Stat. 1542.

66 *See, e.g.*, Brief on Behalf of Genentech, Inc., Amicus Curiae at 4, Diamond v. Chakrabarty, 447 U.S. 303 (1980) (No. 79-136) ("American experience has shown that the Patent System of the United States is one of the most ingenious engines for the inspiration of new technology ever conceived.").

67 Roberts v. Sears, Roebuck & Co., 723 F.2d 1324, 1345 (7th Cir. 1983).

68 *Id.* "The problem is that patent protection has a dark side, to which the term 'patent monopoly' is a clue." *Id.*

69 450 U.S. 175 (1981).

70 447 U.S. 303 (1980).

the judicial attitudes towards resource allocation, as in the example advanced by Posner of late 19th-century riparian rights in the western United States.[71] In the semi-arid southwest it became the common rule of miners and settlers that the first to appropriate water had a prior right to that water no matter where they were located along the stream. Only by establishing property rights in a free market could there be a rational allocation of the resource among competing users.[72]

The analogy between western water resources and the intangible property of advanced scientific research is imperfect at best. Any natural resource is, by defintion, limited and market allocation is useful to promote the most efficient use. But advanced scientific research generates an expanding body of intangible property as scientific knowledge itself advances. An unrestricted award of property rights along the scientific frontier may impede the advancement of knowledge and the creation of new property, even as it seeks to provide incentives for further research.

Furthermore, a property based theory of patent law may be appealing in its simplicity, but it tends to obscure the relevance of competing social values. The free market, arguably, maximizes wealth by reallocating privately owned resources, and yet the increasingly intangible nature of property in the complex world of modern science might require the application of a subtler, more sophisticated jurisprudence. The old majority, whose views survived in Justice Brennan's *Chakrabarty* dissent, asked important questions about the desirable scope of patent protection in the context of high technology.[73] These were difficult questions to ask, and the particular difficulty of answering them in a judicial setting may have been the old majority's[74] undoing. Indeed, the turn to a neater system, one that provides a seemingly simpler judicial function, is consonant with the kind of crisis in evaluative judgment that Michelman himself predicts:

> The idea that rule-by-rule wealth maximizing is a broadly appealing strategy for judicial law making must depend, I believe, on the prior idea that the members of society share a highly cautious view of the capacity and reliability of human speculative reason and value judgment, as applied to the determination of unobservable entities such as welfare and to contested evaluational concepts such as justice. Those who

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71 R. POSNER, *supra* note 57, at 67.
72 *See* Winters v. United States, 207 U.S. 564 (1908).
73 447 U.S. 303, 318-22 (1980) (Brennan, J., dissenting).
74 *See supra* note 21 and accompanying text.

> rule us from the bench would be expected, then, to take the values and norms as expressed by the persons whose interests are ultimately at stake rather than from introspection, and to refrain from constructing the questions they address in terms of elusive phantasmagoria like fairness or happiness.[75]

Clearly, a sound basis exists for dissatisfaction with "elusive phantasmagoria like fairness or happiness"[76] just as there is a sound basis for distrusting the traditional "product of nature" test in the patent law. And a test for statutory construction which uses general and abstract language invites judges to inject their own values and beliefs into the decision-making process. The "rule-by-rule wealth maximizing"[77] approach pretends to be non-normative because it limits judges to choosing between the interests "ultimately at stake rather than from introspection."[78] However, the wealth maximizing approach is based on its own normative assumptions. In the context of patent law, the Court's adoption of an expansive interpretation of the patent statute correlates with a normative preference for an expanding domain for private property and the free market system. This normative preference must be viewed just as cautiously as any other product of "human speculative reason and value judgement."[79]

Similarly, the opinions of the old majority of the Court contain their own normative preferences. Justice Brennan's essays are filled with a kind of aching speculation about societal welfare and "evaluational concepts such as justice."[80] Indeed, these considerations characterize the probing complex effort of the old majority to come to grips with complex new technology. And, given their predisposition to consider broader questions of welfare and justice, together with the continued stability and effectiveness of our patent system in the fiercely competitive world of high technology, it is not surprising that the old majority thought it desirable to acquiesce to Congress.[81]

For if such fundamental and sensitive issues are at stake, it truly is the legislature's province to articulate standards of patentability based upon national, social and industrial needs. Since the underly-

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75 Michelman, *supra* note 58, at 435 (referring to Posner, *Some Uses and Abuses of Economics in Law*, 46 U. CHI. L. REV. 281, 292 (1979); Michelman, *A Comment on Some Uses and Abuses of Economics in Law*, 46 U. CHI. L. REV. 307, 313 (1979)).

76 Michelman, *supra* note 75, at 313.

77 *Id.*

78 *Id.*

79 *Id.* at 435-36.

80 *Id.* at 435.

81 *See supra* note 75 and accompanying text.

ing determination of wealth maximization through the creation of property rights avoids many of these larger questions, or assumes their societal values, the need for deference seems less pressing, and that is consistent with the record of the *Chakrabarty* Court.

Yet, if the task is to articulate the role that a system of proprietary rights should play in the spurring of invention, it is essential to know how that system interdigitates with other inducements that exist within the world of science and technology. Courts do not have the capacity to manipulate the variables, much less the time to fully understand the relationship of one to another.

Thus, as the Court moves toward a more expansive view of patentability—toward the creation of property interests in the fruits of the new technological research—an important element in the debate over the role of protection of intellectual property is likely to be lost. The creation of property rights through the patent and copyrighted laws, is only one way in which we now encourage technological advancement. Considerable stimuli are provided by the public sector as well. Congress has accepted the prod of the Constitution to "promote the Progess of Science and useful Arts. . .,"[82] and the scale of its efforts has grown significantly over the last few decades. In fact, the effective commercialization of government financed research is becoming an ever more important issue for those who are concerned with industrial innovation.

For example, the National Defense Education Act of 1958[83] was established in the post-Sputnik era to provide a new generation of scientists and mathematicians with public subsidies.[84] The National Science Foundation Act of 1950[85] was established to provide incentives for basic scientific research at all levels through direct loans and grants to scientists at academic institutions and non-profit organizations. Congress created these programs "to promote the progress of science; to advance the national health, prosperity, and welfare, [and] to secure the national defense" in a scheme distinct from private investment.[86] More recently, the Energy Security Act

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[82] U.S. CONST. art. I, § 8, cl. 8.

[83] National Defense Education Act of 1958, Pub. L. No. 85-846, § 401, 72 Stat. 1580, 1590 (1958) (codified as amended at 20 U.S.C. § 401 (1982) (§§ 401-403 repealed 19—) (programs under this section have not been funded for a number of years and fellowships under section 461 have not been funded since 1973).

[84] *Id.* at 1582.

[85] Ch. 171, 64 Stat. 149 (codified as amended at 42 U.S.C. § 1861 (1982)).

[86] S. REP. No. 90, 81st Cong., 2d Sess. 1, *reprinted in* 1950 U.S. CODE CONG. & ADMIN. NEWS 2269-70. *See* H.R. REP. No. 2157, 85th Cong., 2d Sess. 1, *reprinted in* 1958 U.S. CODE CONG. & ADMIN. NEWS 4731 (The purpose of the National Defense Education Act was "to strengthen the national defense and to encourage and assist in the expansion and improvement of educational programs to meet critical national needs.").

of 1980[87] was promulgated to fund research into alternative energy sources for both industrial and commercial use.

In a sense, then, parallel systems of incentives have been created with little attention paid to the interrelation between the two. Perhaps the fundamental question should not be, as it was in *Chakrabarty*,—and perhaps, as it must be in any court—whether a particular type of invention should be patentable. Rather, we should ask how a society can best mix its incentives to provide the most productive and efficient result. This is what we mean by establishing an industrial policy, one that unites a redefinition of antitrust policy, taxation and trade policy, with other economic incentives to strengthen certain sectors of the economy. In a society where production rests on a combination of intellectual resourcefulness and the incentive for capital investment to make that resourcefulness fruitful, patent policy—or put broadly, the incentive for creativity and investment—must be part of such an industrial policy.[88]

V. Conclusion

In important ways, Melville Nimmer was uncomfortable with the intense reexamination of the premises and with the questioning of the fundamental assumptions on which the intellectual property system was founded. His dedication was to establish and extend the rationality of the system to explain and clarify. His brilliance as an advocate and as a scholar rested in his astounding ability to simplify. He could reduce vast industrial conflicts to common-sensical adjustments in pre-existing dogma. His was a legal system that was tightly roped to its moorings. It did not admit to a sociological jurisprudence. It did not rest on sophisticated studies of behavior. It was one which felt that the assumptions about social needs were already encompassed in the way the system itself was established.

However, vast industrial conflicts do not necessarily disappear with adjustments to doctrine. Vast changes in context do occur and finally call into question the assumptions of the legal structures that predated them. The area of encouraging intellectual property developed during the lifetime of Melville Nimmer. New technology after new technology appeared, each posing new

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[87] Pub. L. No. 96-294, 94 Stat. 611 (1980).

[88] For example, in furtherance of a policy of encouraging investment in research, Patent No. 4, 736,866 for transgenetic nonhuman mammals (i.e., genetically altered mice) was granted to Harvard University—a "singulary historic event." N.Y. Times, Apr. 13, 1988, at A1, col. 5. The invention will provide an efficient model for testing the role of genetics in the development of cancer. *Id.*

challenges to a stable legal system. Most important, the democratization of the new technology, through widely available videocassette recorders and personal computers has made copying more democratically legitimate and violations of the law far more difficult to enforce. Finally, the nature of the new contributions and the growth of alternatives available for encouraging those contributions—especially the role of government as sponsor of innovation—has, at some level, led to change the ways in which we think about intellectual property and its protection and use.

The strain on the elegant legal system so nicely perfected by Melville Nimmer has become more and more profound. Foreign and domestic competition for the subvention of new technology has become intense. International competition to determine where geopolitical power will lie in the next century often turns on command of the new technology and trade in its fruits. The consequence has been inevitable pressure to examine the underpinnings of our system of encouraging innovation. The answer of the *Chakrabarty* court was to place more weight on the property rights model of encouragement of rights. In the long run, that particular answer may not be exclusively the right one; but the important point is that the process of defining and challenging the fundamental assumptions must be more carefully explored.