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Plants are properly Patentable under Prevailing U.S. Law and this is Good Public Policy

by

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PLANTS ARE PROPERLY PATENTABLE UNDER PREVAILING U.S. LAW AND THIS IS GOOD PUBLIC POLICY

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I. INTRODUCTION[3]

In the Fall 2005 issue of this Journal, Nathan Busch argues that genetically modified plants are not "inventions" and are therefore not patentable.[4] This essay serves as a rebuttal to Busch's article and argues that plants are properly patentable under prevailing U.S. law and that this fact is also good public policy.

The Busch article argues the following points:

(a) Plants are not "inventions" or discoveries within the meaning of the U.S. Constitution and the patent statutes;

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3. The authors would like to acknowledge and thank Drake 3L, Krista M. Hyland, for her research assistance.

4. Nathan A. Busch, *Genetically Modified Plants Are Not "Inventions" and Are, Therefore, Not Patentable*, 10 DRAKE J. AGRIC. L. 387 (2005).

(b) While it is established under the U.S. patent laws that plants, plant seed, and plant cells are patentable subject matter, they should not be;
(c) Genetically modified plants should not be patentable in either Canada or the United States;
(d) The "law of nature" doctrine and the lack of "volitive acts" should preclude the patentability of plants as well as cells which include a trans-gene.[5]

As we argue in this essay, each of these zealous assertions is either wrong under existing U.S. law, or are conclusions which lack supporting law or data.

Recently, in *J.E.M. AG Supply, Inc. v. Pioneer Hi-Bred International, Inc.*, the Supreme Court held that plants are statutory subject matter under 35 U.S.C. § 101.[6] Declining to narrowly construe section 101, the Court stated:

> We hold that newly developed plant breeds fall within the terms of § 101, and that neither the PPA [Plant Patent Act] nor the PVPA [Plant Variety Protection Act] limits the scope of § 101's coverage. As in *Chakrabarty*, we decline to narrow the reach of § 101 where Congress has given us no indication that it intends this result.[7]

That plants are statutory subject matter under U.S. patent laws is therefore indisputable.

It is the contention of the authors of this article that no good reason exists for discriminating against inventors of newly developed plants and not allowing them the full benefit of the U.S. patent system. This argument finds support throughout the history of U.S. patent law. Famous inventors and plant breeders such as Thomas Edison and Luther Burbank testified before Congress in support of the 1930 Plant Patent Act ("PPA"), arguing that awarding patents to plant breeders would be of immense value.[8] Representative Vestal, a member of the Committee on Patents at the time the PPA was being considered, also argued that newly developed plants were worthy of patent protection:

> No one has advanced a just and logical reason why reward for service to the public should be extended to the inventor of a mechanical toy and denied to the genius whose patience, foresight, and effort have given a valuable new variety of fruit or other plant to mankind.

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5. *Id.* at 390, 449, 451, 455.
6. J.E.M. AG Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc., 534 U.S. 124, 145 (2001). *See infra* Part III (for a more thorough discussion of plants as patentable subject matter).
7. *Id.* at 145-46.
8. Hearings on H.R. 11372 Before the House Comm. On Patents, 71st Cong. 3, at 2-3 (1930).

> This bill is intended not only to correct such discrimination, but in doing so it is hoped the genius of young agriculturists of America will be enlisted in a profitable work of invention and discovery of new plants that will revolutionize agriculture as inventions in steam, electricity, and chemistry have revolutionized those fields and advanced our civilization.[9]

Busch surmises in his article that in Canada, plants are not properly patentable because Canada does not allow patents for "higher life forms."[10] Irrespective of the legitimacy of this argument, it is not altogether relevant to a proper interpretation of U.S. patent law. In this article, we argue that plants are properly patentable in the United States and that the U.S. system is more correct and beneficial for the international agricultural community. Because any decision which finds that plants are or are not patentable subject matter in Canada would be based on different law than that which is discussed here, the validity of such a decision is outside the proper scope of this article, policy arguments notwithstanding.

In the United States, multiple means exist for the protection of intellectual property related to plants, plant material, and plant seeds. Four of these are statutory: plant utility patents, which we will discuss in more detail *infra*; ordinary plant patents for asexually produced plants under the PPA[11]; Plant Variety Protection Act ("PVPA")[12] certificates for sexually reproducing and tuber propagating plants; and design patents for ornamentals.[13] In addition, a variety of other state law protection regimes may be available, including trade secret law, state unfair competition law, and state contract law (in the form of so-called "seed wrap" or "bag-tag" licenses).[14] As far as we are aware, no other country offers as expansive protection for plants as the United States.

Due to the Supreme Court's pronouncement in *J.E.M. AG Supply* that the PPA and the PVPA "are capable of coexist[ing]" with utility patent protection, it is worth discussing at least some aspects of protection afforded by each of the acts.[15] The PPA provides intellectual property coverage to breeders of asexually

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9. Hearings on H.R. 11372 Before the House Comm. On Patents, 71st Cong. 3, at 2 (1930).

10. Busch, *supra* note 4, at 406; *see* Harvard Coll. v. Canada (Comm'r of Patents), [2002] 4 S.C.R. 46 ¶ 201.

11. Plant Patent Act of 1930, 35 U.S.C.A. § 161 (2006).

12. Plant Variety Protection Act of 1970, 7 U.S.C.A. § 2321 (2006).

13. *See* 35 U.S.C.A. §§ 171-173 (2006) (design patents receive their statutory basis from these statutes).

14. *See* Mark D. Janis, *Supplemental Forms of Intellectual Property Protection for Plants*, 6 MINN. J. L. SCI. & TECH. 305 (2004) (providing excellent discussion of these state law protection regimes).

15. *J.E.M. AG Supply, Inc.*, 34 U.S. at 143-44.

produced plants, except for tuber propagating plants.[16] Congress' intent in passing the PPA was to provide plants, to the extent to which it was practicable at the time, patent protection which was on par with inventions in other technical areas.[17] The PPA's exclusion of sexually reproduced or tuber propagated plants was at least partially due to the "perception at the time that such varieties were not adequately identifiable, uniform, or stable" to warrant patent protection.[18]

In 1970, Congress passed the PVPA legislation.[19] The PVPA gives intellectual property protection for plants which are not covered by the PPA, i.e. sexually reproducing plants and tuber propagating plants.[20] In order to obtain a PVPA certificate, a plant must be new, distinct, uniform, and stable.[21] While the PVPA provides protection for unauthorized selling, importing, exporting, sexually reproducing, or using a variety to produce another variety,[22] it also contains "saved seed" and "research" exemptions.[23] These exemptions allow for farmers to save an amount of seed required for replanting and for the use of a protected variety for breeding purposes.[24] The scope of protection under the PVPA and the PPA has been likened to a copyright, essentially protecting only against copying from a physically accessible plant.[25]

Even the modest protection afforded by the PVPA and the PPA has, however, likely had a positive effect on the development of new plant innovations and varieties. For example, in the decade after the PVPA was enacted, three times as many wheat and soybean and six times as many cotton varieties were developed than in the decade prior to the Act's passage.[26]

We also acknowledge that there are different systems of intellectual property protection for plants around the world. The International Convention for the Protection of New Varieties of Plants ("UPOV") was adopted originally by European countries in 1961, and later revised in 1978 and 1991.[27] Similar to

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16. *See* 35 U.S.C.A. § 161 (2006).

17. *See* Imazio Nursery, Inc. v. Dania Greenhouses, 69 F.3d 1560, 1563 (Fed. Cir. 1995).

18. JORGE FERNANDEZ-CORNEJO, THE SEED INDUSTRY IN U.S. AGRICULTURE 20 (2004), *available at* http://www.ers.usda.gov/publications/aib786/aib786.pdf.

19. 7 U.S.C.A. § 2321 (2006).

20. *Id.* § 2402.

21. *Id.* § 2402(a)(1)-(4).

22. *Id.* § 2541(a)(1) – (4).

23. *Id.* §§ 2543-2544.

24. *Id.*

25. *See Imazio Nursery, Inc.* 69 F.3d at 1567.

26. H.R. REP. NO. 96-1115, at 4 (1980), *reprinted in* 1980 U.S.C.C.A.N. 6954, 6956.

27. The International Convention for the Protection of New Varieties of Plants, Dec. 2, 1961, 33 U.S.T. 2703, 815 U.N.T.S. 89 (as revised at Geneva on Nov. 10, 1972, Oct. 23, 1978). The Mar. 19, 1991, revised text is *available at* http://www.upov.int/en/publications/conventions/

the requirements for protection under the PVPA, a plant must be new, distinct, uniform, and stable in order to obtain a plant breeder's certificate under the UPOV.[28] Under the 1991 Amendments, protection is extended to "essentially derived varieties."[29] Again similar to the PVPA, the UPOV not only provides protection for unauthorized selling, importing, exporting, sexually reproducing, or using a variety to produce another variety, but also provides for a saved seed and research exemption.[30] The "saved seed" exemption allows for the use of saved seed in later seasons.[31] Under the 1991 agreement, each UPOV member country has the option to include the exemption.[32] The "research" exemption allows a protected variety to be used for breeding other varieties or for experimental purposes.[33]

In contrast with the United States, the Convention on the Grant of European Patents, to which twenty-seven European countries are currently members, specifically excludes plant varieties from being eligible for normal utility patent protection.[34] Under the 1991 version of UPOV, European Patent Convention member states may eliminate the provision excluding plant varieties from being available for patent protection.[35]

In this article, we discuss and compare the system of utility patent protection offered by the United States with respect to inventions related to plants. Ultimately, we argue that the U.S. system is beneficial to the agricultural system of the United States as well as to the larger worldwide agricultural community.

1991/content.htm [hereinafter UPOV 1991]. *See also* Amy Nelson, Note, *Is There An International Solution To Intellectual Property Protection for Plants*?, 37 GEO. WASH. INT'L L. REV. 997, 1004 (2005).

28. UPOV 1991, *supra* note 27, at Art. 5.

29. *Id.* at Art. 14(5) (also stating that a variety is "essentially derived" if it is derived predominantly from the protected variety, retains the expression of the protected varieties' essential characteristics, is clearly distinguishable from the protected variety, and, except for the differences which are the result of the derivation, retains the expression of the essential characteristics of the protected variety).

30. *Id.* at Arts. 14, 15.

31. *Id.* at Art. 15(2); Nelson, *supra* note 27, at 1004.

32. UPOV 1991, *supra* note 27, at Art. 15(2) (containing the "optional" exception clause to breeder's rights).

33. *Id.* at Art. 15(1).

34. Convention on the Grant of European Patents, Oct. 5, 1973, *available at* http://www.european-patent-office.org/legal/epc/e/ma1.html [hereinafter European Patents]; Nelson, *supra* note 27, at 1004.

35. European Patents, *supra* note 34, at Art. 53.

II. CONSTITUTIONAL MEANING OF INVENTORS AND DISCOVERIES IN ARTICLE I, SECTION 8, CLAUSE 8

Congress has inherent Constitutional powers to adopt a patent system. Article I, Section 8, Clause 8 of the U.S. Constitution states: "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."[36]

Justice Douglass stated in his concurring opinion in *Great Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp.* that "every patent case involving validity presents a question which requires reference to a standard written into the Constitution."[37] The Court in *Graham v. John Deere Co. of Kansas City*, in the context of reviewing the non-obviousness standard of section 103, further

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36. U.S. CONST. art. I, § 8, cl. 8. Multiple scholars have concluded that the Constitutional purpose of patent rights is based on the promotion of the "useful Arts," not the "Progress of Science." *See, e.g.*, P.J. Federico, *Commentary on the New Patent Act*, 75 J. PAT. & TRADEMARK OFF. SOC'Y 161 (1993); Karl B. Lutz, *Patents and Science: A Clarification of the Patent Clause of the U.S. Constitution*, 18 GEO. WASH. L. REV. 50 (1949); Giles S. Rich, *The Principles of Patentability*, 28 GEO. WASH. L. REV. 393 (1960). Both the House of Representatives and the Senate included in their reports on the 1952 Act the following interpretation of the relevant constitutional clause:

> The background, the balanced construction, and the usage current then and later, indicate that the constitutional provision is really two provisions merged into one. The purpose of the first provision is to promote the progress of science by securing for limited times to authors the exclusive right to their writings, the word 'science' in this connection having the meaning of knowledge in general, which is one of its meaning today. The other provision is that Congress has the power to promote the progress of useful arts by securing for limited times to inventors the exclusive right to their discoveries. The first patent law and all patent laws up to a much later period were entitled 'Acts to promote the progress of useful arts.'

H.R. Rep. No. 82-1923, at 4 (1952), S. Rep. No. 82-1979, at 3 (1952), both *as reprinted in* 1952 U.S.C.C.A.N. 2394, 2396.

37. Great Atl. & Pac. Tea Co. v. Supermarket Equip. Corp., 340 U.S. 147, 154 (1950) (Douglas, J. concurring). Justice Douglas further stated:

> Article 1, Section 8, contains a grant to the Congress of the power to permit patents to be issued. But unlike most of the specific powers which Congress is given, that grant is qualified. The Congress does not have free reign, for example, to decide that patents should be easily or freely given. The Congress acts under the restraint imposed by the statement of purpose in Art. 1, § 8.

Id. The majority opinion did not make reference to the Constitutional Clause in holding the patent at issue invalid for lack of a patentable invention. *Id.* at 152 (majority opinion).

stated that "patent validity 'requires reference to a standard written into the Constitution.'"[38]

These statements by the Court cannot be taken to mean that every patent case is a constitutional case, for several reasons. Congress has the authority "[t]o make all Laws which shall be necessary and proper for carrying into Execution the foregoing Powers [Article I], and all other Powers vested by this Constitution in the Government of the United States, or in any Department or Officer thereof."[39] The judicial inquiry should therefore be whether Congress acted within its enumerated power in enacting 35 U.S.C. § 1 (the Patent Laws), not whether every patent meets a constitutional standard. For the courts to do otherwise would be contrary to the infamous statements made by Chief Justice Marshall in *McCulloch v. Maryland*: "[w]here the law is not prohibited, and is really calculated to effect any of the objects entrusted to the government, to undertake here to inquire into the de[g]ree of its necessity, would be to pass the line which circumscribes the judicial department, and to tread on legislative ground."[40] As stated by the Court in *McClurg v. Kingsland*,

> the powers of Congress to legislate upon the subject of patents is plenary by the terms of the Constitution, and as there are no restraints on its exercise, there can be no limitation of their right to modify [the legislation] at their pleasure, so that they do not take away the rights of property in existing patents.[41]

Constitutional scholars have recently suggested that congressional legislation affecting intellectual property rights should be given the same deferential review as legislation affecting traditional property rights.[42] "[C]oncerns about institutional competence and respect for majoritarian decisionmaking. . . . [and] [h]olistic constitutional interpretation" lead to this conclusion.[43]

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38. Graham v. John Deere Co. of Kansas City, 383 U.S. 1, 6 (1966) (quoting *Great Atl. & Pac. Tea Co.*, 340 U.S. at 154 (Douglas, J., concurring)).

39. U.S. CONST. art I, § 8, cl. 18; *see also* McCulloch v. Maryland, 17 U.S. 316, 421 (1819) (famously stating "[l]et the end be legitimate, let it be within the scope of the constitution, and all means which are appropriate, which are plainly adapted to that end . . . are constitutional.").

40. *McCulloch*, 17 U.S. at 423.

41. McClurg v. Kingsland, 42 U.S. 202, 206 (1843).

42. *See* Paul M. Schwartz & William Michael Treanor, *Eldred and Lochner: Copyright Term Extension and Intellectual Property as Constitutional Property*, 112 YALE L.J. 2331, 2334 (2003).

43. *Id.* In discussing the judicial review appropriate for legislation passed under the Intellectual Property Clause, the authors of this article note:

> Intellectual property legislation such as the CTEA does not encroach upon the authority of a government entity unrepresented in the political process (such as juries or courts). As a consequence, under the view advanced here, the original understanding would be that the standard of judicial review is a very deferential one. Under this dominant schol-

The rational basis test has recently been used by courts in reviewing legislation passed by Congress under its Intellectual Property power. The United States Court of Federal Claims, in reviewing the fee structure of the current system, noted that

> [a]ny intellectual property law Congress passes need only survive the limited scrutiny of the rational basis test as to whether it promotes the progress of science and the useful arts. Plaintiff may well be correct that the current patent fee regime is misguided and creates the wrong incentives, but such policy determinations are for Congress, and not the courts, to make.[44]

The court ultimately held that the plaintiff had not met his burden of showing that Congress had behaved irrationally.[45]

Recently, in *Eldred v. Ashcroft*, the Supreme Court reviewed the constitutional basis of copyright legislation passed by Congress which extended the terms of existing copyrights.[46] Therein, the Court deferred to the policy judgments made by Congress in extending the terms of copyrights and emphasized that it was the role of Congress to decide if intellectual property legislation furthered the goals of the Intellectual Property Clause.[47] The Court noted, "[t]he wisdom of Congress' action . . . is not within our province to second-guess."[48] Since the same constitutional clause applies equally to patents and copyrights, the *Eldred* pronouncements on legislative deference are important to congressional acts relating to patents.

The Supreme Court has interpreted the patent clause as requiring that the individual receiving the "exclusive right" must be an inventor and have made a discovery.[49] In *Graham*, the Supreme Court described this clause as "both a grant of power and a limitation."[50] What exactly is the nature of this limitation?

> arly view, deference is appropriate here because the original understanding was that deference was *always* appropriate.

Id. at 2374 (emphasis added); *see also id.* at 2411 (stating "[i]t is therefore significant to the proper interpretation of the Copyright Clause that judicial deference to economic legislation has become the norm in the interpretation of the Due Process Clause and the Contracts Clause. Unless a good reason exists to treat the Copyright Clause differently, the norms established in analytically similar areas should govern the intellectual property area as well."); *see also* Eldred v. Ashcroft, 537 U.S. 186, 216 (2003) (stating that it is generally for Congress, not the Courts, to decide how best to pursue the Copyright Clause's objectives).

44. Figueroa v. United States, 24 Biotechnology L. Rep. 771, 782 (Ct. Fed. Cl. 2005).
45. *Id.*
46. *Eldred*, 537 U.S. 186 (2002).
47. *Id.* at 204-05.
48. *Id.* at 222.
49. Thompson v. Boisselier, 114 U.S. 1, 11 (1885).
50. *Graham*, 383 U.S. at 5.

According to the Court in *Graham*, the patent laws enacted by Congress must "promote the Progress of Science and useful Arts":

> The Congress in the exercise of the patent power may not overreach the restraints imposed by the stated constitutional purpose. Nor may it enlarge the patent monopoly without regard to the innovation, advancement or social benefit gained thereby. Moreover, Congress may not authorize the issuance of patents whose effects are to remove existent knowledge from the public domain, or to restrict free access to materials already available. Innovation, advancement, and things which add to the sum of useful knowledge are inherent requisites in a patent system which by constitutional command must 'promote the Progress of . . . useful Arts.' This is the standard expressed in the Constitution and it may not be ignored.[51]

The *Graham* court went on to note that Congress, acting under the power of the Intellectual Property Clause, could further the "purpose of the Framers by selecting the policy which in its judgment best effectuates the constitutional aim."[52]

Scholars have recently directed their research towards seeking the original understanding of the Intellectual Property Clause.[53] The Clause's reference to "limited Times" is traceable to James Madison; "exclusive Rights" are traceable to Charles Pinkney.[54] According to the available records, minimal discussion of this Clause occurred during the Constitutional Convention and the ratification process.[55] However, according to Paul Schwartz and William Michael Treanor, all recorded public statements made during the Convention and ratification were made in support of the inclusion of the Clause, versus any explanation of why the power vested in Congress was limited.[56] Schwartz and Treanor summarize the historical record available during the ratification process as "[t]he accent is on the positive."[57]

Particularly illuminating as to the reason for "limited Times" is a memoranda written by James Madison sometime after he left the presidency. Therein, Madison states:

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51. *Id.* at 5-6.

52. *Id.* at 6.

53. *See, e.g.*, Ruth L. Okediji, *Through The Years: The Supreme Court and The Copyright Clause*, 30 WM. MITCHELL L. REV. 1633 (2004) (exploring the original understanding of the Clause in the context of the Supreme Court case *Eldred v. Ashcroft*); Schwartz & Treanor, *supra* note 42 (also exploring the original understanding of the Clause in the context of the Supreme Court case *Eldred v. Ashcroft*).

54. Schwartz & Treanor, *supra* note 42, at 2375.

55. *See id.* at 2375-6 (summarizing and discussing the recorded statements made concerning the then proposed clause during the Convention and the subsequent ratification process).

56. *Id.* at 2376.

57. *Id.*

> Monopolies tho' in certain cases useful ought to be granted with caution, and guarded with strictness agst abuse. The Constitution of the U.S. has limited them to two cases, the authors of Books, and of useful inventions, in both which they are considered as a compensation for a benefit actually gained to the community as a purchase of property which the owner might otherwise withhold from public use. There can be no just objection to a temporary monopoly in these cases: but it ought to be temporary, because under that limitation a sufficient recompence and encouragement may be given. The limitation is particularly proper in the case of inventions, because they grow so much out of preceding ones that there is the less merit in the authors: and because for the same reason, the discovery might be expected in a short time from other hands.[58]

Madison, it seems, while cautious about any permanent nature to the monopoly grant, clearly favored the grant of protection to inventors for their discoveries, as long as the time was limited.

Unfortunately, to the authors' knowledge, there does not appear to be any historical evidence as to what the Framers considered the meaning or definition of "discoveries" or "inventors" to be. At the time of the drafting and ratification of the Constitution, the dictionary definition of "inventor" was, in the first place "[a] finder out of something new"[59] and in the second place, someone who created something new. "Discovery" has a very similar definition: "the act of finding any thing hidden" or "the act of revealing or disclosing any secret."[60] These definitions emphasize discovery as relating to something which was not before known.[61] Similarly, the Supreme Court has described an inventor as "one who has discovered something of value."[62] Evidence that the Framers probably considered an "inventor" as someone who discovers something new is shown by the fact that the Constitutional Clause contains the term "discoveries," and not "inventions."[63]

There is accordingly no evidence, that we are aware of, which indicates that the Framers had any intention that either of the terms "inventors" or "discoveries" be interpreted in a manner which would preclude plants from being patentable subject matter, as long as the new plant varieties embodied something

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58. *Id.* at 2385.

59. *See* SAMUEL JOHNSON, A DICTIONARY OF THE ENGLISH LANGUAGE (1755); *see also* Hearings on H.R. 11372 Before the House Comm. On Patents, 71st Cong. 3 (1930) (listing multiple dictionary definitions of the term "inventor" from the time of the adoption of the Constitution).

60. *See* JOHNSON, *supra* note 59; *see also* Hearings on H.R. 11372, *supra* note 59, (listing multiple dictionary definitions of the term "discovery" from the time of the adoption of the Constitution).

61. *See* JOHNSON, *supra* note 59; *see also* Hearings on H.R. 11372, supra note 59.

62. United States v. Am. Bell Tel. Co., 167 U.S. 224, 250 (1897).

63. *See* Hearings on H.R. 11372, *supra* note 59 (concluding that the term "inventors" encompassed someone who discovered something new at the time of the writing of the Constitution).

new. Accordingly, the decision is appropriately left to Congress, whom, as discussed in sections III and IV *infra*, have written section 101 using broad and forward-thinking language, which in turn has been interpreted by the Supreme Court to include plants as statutory subject matter, along with "anything under the sun that is made by man."[64]

III. IT IS WELL SETTLED LAW THAT PLANTS ARE PATENTABLE SUBJECT MATTER

In 1980, the Supreme Court issued its decision in *Diamond v. Chakrabary,* ultimately holding that live, human-made microorganisms were patentable subject matter under 35 U.S.C. § 101.[65] The holding ultimately paved the way for the conclusions of *Ex parte Hibberd*[66] and *J.E.M. AG Supply,*[67] that plants are patentable subject matter under 35 U.S.C. § 101.

The Supreme Court's decision in *Chakrabarty* was in part premised on its recognition that Congress had decided to give section 101 wide scope: "In choosing such expansive terms as 'manufacture' and 'composition of matter,' modified by the comprehensive 'any,' Congress plainly contemplated that the patent laws would be given wide scope."[68] By defining the patent law in broad terms, the Court noted that Congress had chosen "to fulfill the constitutional and statutory goals of promoting 'the Progress of Science and the useful Arts' with all that means for the social and economic benefits envisioned by Jefferson."[69] The question of whether living things could be patentable was accordingly a question of statutory interpretation.[70]

The Court in *Chakrabarty* initially cited its earlier decision in *Funk Brothers Seed Co. v. Kalo Inoculant Co.*, stating that:

> [A] new mineral discovered in the earth or a new plant found in the wild is not patentable subject matter. Likewise, Einstein could not patent his celebrated law that E = mc^2; nor could Newton have patented the law of gravity. Such discoveries are 'manifestations of . . . nature, free to all men and reserved exclusively to none.[71]

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64. Diamond v. Chakrabatry, 447 U.S. 303, 309 (1980).
65. *Id.* at 310.
66. Ex parte Hibberd, 227 U.S.P.Q. 443, 443-4, 448 (1985).
67. *J.E.M. AG Supply, Inc.*, 534 U.S. at 145.
68. *Chakrabarty*, 447 U.S. at 308.
69. *Id.* at 315.
70. *Id.* (noting that "Congress has performed its constitutional role in defining patentable subject matter in § 101; we perform ours in construing the language Congress has employed.").
71. *Id.* at 309 (quoting Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1948)).

However, the Court then proceeded to distinguish the case before it from its earlier decisions. The claims at issue in *Funk Brothers* were product claims, the subject of which were the combination of multiple naturally occurring root-nodule bacteria which did not have an inhibiting effect on each other:

> 'Each of the species of root-nodule bacteria contained in the package infects the same group of leguminous plants which it always infected. No species acquires a different use. The combination of species produces no new bacteria, no change in the six species of 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 ends nature originally provided and act quite independently of any effort of the patentee.'[72]

In *Chakrabarty*, however, the "patentee ha[d] produced a new bacterium with markedly different characteristics from any found in nature and one having the potential for significant utility."[73] This distinguished *Funk Brothers* from the case which was presently before the Court. The Court therefore concluded "[h]is [Chakrabarty's] discovery is not nature's handiwork, but his own; accordingly it is patentable subject matter under § 101."[74] The distinction between patentable and unpatentable subject matter therefore exists between a "natural phenomenon" on the one hand and "nonnaturally occurring manufacture[s] or composition[s] of matter" on the other.[75]

The fact that the subject matter might be living is irrelevant to the section 101 analysis.[76] As the *Chakrabarty* Court explained, "the relevant distinction was not between living and inanimate things, but between products of nature, whether living or not, and human-made inventions."[77]

In *J.E.M. AG Supply*, the Supreme Court held that "newly developed plant breeds fall within the terms of § 101."[78] Pioneer Hi-Bred International filed a complaint against J.E.M. AG Supply, Inc. for patent infringement, after learning that J.E.M. (doing business as Farm Advantage, Inc.) was purchasing patented bags of Pioneer seed and then reselling the bags of seed.[79] J.E.M. then filed a counterclaim, asserting that issued utility patents on plants were invalid because plants did not constitute statutory subject matter under section 101.[80] The District

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72. *Id.* at 310 (citing *Funk Bros. Seed Co.*, 333 U.S. at 131).
73. *Id.*
74. *Id.*
75. *Id.* at 309.
76. *Id.* at 313.
77. *Id.*
78. *J.E.M. AG Supply, Inc.*, 534 U.S. at 146.
79. *Id.* at 128.
80. *Id.* at 129.

Court for the Northern District of Iowa granted summary judgment for Pioneer, relying on the Court's construction of section 101 in *Chakrabarty*.[81] The federal circuit affirmed the district court's judgment and reasoning.[82]

Early in its opinion, the Supreme Court established that "Congress ha[d] performed its constitutional role" by writing section 101 and that it was now the role of the judiciary to construe the language Congress used.[83] *Chakrabarty* had previously interpreted section 101 as being broad in scope, encompassing living things which were "human-made inventions."[84] The Court additionally noted that the U.S. Patent Office, following the decision in *In re Hibbard* that plants were patentable "composition of matter" or "manufacture" and were therefore statutory subject matter, had regularly issued utility patents for plants.[85] In fact, over 1,800 utility patents for germplasm were issued after the decision of *In re Hibbard*.[86]

Section 101, the Court stated, "is a dynamic provision designed to encompass new and unforeseen inventions."[87] Plants, therefore, had always had the potential to be within the scope of section 101.[88] Neither the PVPA nor the PPA limited the scope of section 101-in fact, the Court held that both the PVPA and the PPA "can be read alongside section 101 in protecting plants."[89] Accordingly, the Court additionally held that the plain meaning of section 101 "included plants within its subject matter."[90]

Busch argues in his essay that genetically modified plants are not patentable because they follow the "laws of nature" doctrine.[91] Busch argues that plants which have been genetically modified can not be patentable because it is the "laws of nature," not human intervention, which cause the plant to grow and develop.[92] The only human contribution, Busch argues, is the transgene; the rest of the plant is created according to the "laws of nature."[93] Busch makes a similar

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81. *Id.*
82. *Id.*
83. *Id.* at 130-31.
84. *Id.* at 130 (citing *Chakrabarty*, 447 U.S. at 313).
85. *Id.* at 131.
86. Keith Aoki, *Weeds, Seeds & Deeds: Recent Skirmishes in the Seed Wars*, 11 CARDOZO J. INT'L & COMP. L. 247, 289 (2003).
87. *J.E.M. Ag Supply, Inc.*, 534 U.S. at 135.
88. *Id.* at 130-31.
89. *Id.* at 144.
90. *Id.*
91. Busch, *supra* note 4, at 403.
92. *Id.* at 424.
93. *Id.*

argument with respect to cells containing a transgene.[94] These are old arguments properly rejected by our courts years ago.

As discussed *supra*, the Supreme Court has made a distinction regarding section 101 patentable subject matter between human-made inventions and *products* of nature.[95] Busch's argument therefore misapplies the distinction between patentable and unpatentable subject matter. The test is not whether "laws of nature" are involved in creating the invention, but rather whether the invention or discovery is something that is human-made versus something that is wholly naturally occurring. In fact, for over 150 years courts have consistently rejected application of a "laws of nature" rule. Carried to its extreme, such a rule as that advocated by Busch would render any subject matter unpatentable, since every machine, chemical compound, or composition of matter ultimately utilizes a "law of nature." Indeed, the Supreme Court has recognized that the act of invention consists in discovering how the laws of nature "may be utilized or applied for some beneficial purpose" by a machine, manufacture, or composition of matter.[96]

As early as 1853, the Supreme Court recognized in a dissenting opinion that patentable inventions existed where the "laws of nature" were utilized and applied to "man-made inventions"[97]:

> The mere discovery of a new element, or law, or principle of nature, without any valuable application of it to the arts, is not the subject of a patent. But he who takes this new element or power, as yet useless, from the laboratory of the philosopher, and makes it the servant of man; who applies it to the perfecting of a new and useful art, or to the improvement of one already known, is the benefactor to whom the patent law tenders its protection.[98]

Utilizing similar reasoning, courts have historically found that the embodiment and application of natural laws to "machinery" may be the subject of a patent.[99] In an 1881 case involving the patentability of a new machine, the Southern District of New York noted:

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94. *Id.*at 424-5.

95. *Chakrabary*, 447 U.S. at 313.

96. United States v. Dubilier Condenser Corp., 289 U.S. 178, 188 (1933).

97. *Chakrabary*, 447 U.S. at 321 (Brennan, J., dissenting).

98. O'Reilly v. Morse, 56 U.S 62, 132-33 (1853) (Grier, J., dissenting); *see also* Le Roy v. Tatham,, 63 U.S. 132, 135-36 (1859) in which the Court stated:

> A patent will be good, though the subject of the patent consists in the discovery of a great, general, and most comprehensive principle in science or law of nature, if that principle is, by the specification, applied to any special purpose, so as thereby to effectuate a practical result and benefit not previously attained.

99. *See* Hammerschlag v. Scamoni, 7 F. 584, 589-90 (S.D.N.Y. 1881); Wintermute v. Redington, 30 F.Cas. 367, 371 (N.D. Ohio 1856) (stating "percussion, reaction, and centrifugal force are, in the abstract, neither new principles nor subjects of a patent. But their embodiment and

> In all machinery, the arrangement of it is designed to secure the operation of laws whose operation is certain to follow such arrangement of it, and those certain laws are the laws of nature; and it is because those known laws are certain to follow such arrangement, that the arrangement is made. The arrangement is none the less an invention because it brings into operation the laws of nature.[100]

The "law of nature" doctrine has also been rejected as an argument against patentability in multiple instances for inventions comprising chemical elements and compounds. For example, it is axiomatic that a patent may not be obtained for a naturally occurring element, even if newly discovered.[101] Conversely, if it is a new compound which does not exist in nature, then the inventor may be entitled to a patent.[102]

The case of *Schering Corp. v. Gilbert* is particularly illustrative.[103] The relevant claim at issue was to a chemical compound which is not found in nature and which prior to the patentees' work had not been synthesized.[104] The defendants in that case argued that because the claim was to a new molecule and that because a molecule is the inevitable result of "laws of nature," the claim is invalid.[105] The court rejected this argument, noting that if defendants' argument held merit, any patent to a composition of matter or machine would be invalid:

> If this were wholly true the corollary would be that the process by which a result is reached, involving as it does the application of natural laws, would be likewise unpatentable and that there could be no valid patents for new compositions of matter. Similarly, there could be no valid patents for new machines or for new methods of making them since so-called natural laws of physics, such as those relating to gravity and friction, to mention only two, always play their part. Obviously, such an ad-

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application to machinery may be both new and useful, and entitle the discoverer to the exclusive use of his invention.").

100. *Hammerschlag*, 7 F. at 589-90.

101. *See* General Elec. Co. v. De Forest Radio Co., 28 F.2d 641, 642 (3d Cir. 1928) (stating that "[i]f it is a natural thing then clearly, even if Coolidge was the first to uncover it and bring it into view, he cannot have a patent for it because a patent cannot be awarded for a discovery or for a product of nature, or for a chemical element.").

102. *Compare* J.E. Baker Co. v. Kennedy Refractories Co., 253 F. 739, 742 (3d Cir. 1918) (noting "[w]e regard magdolite as 'a new article of manufacture' in the sense at least of being wholly different from any article previously manufactured and from anything existing in nature . . ."), *with General Elec. Co.*, 28 F.2d at 642 (stating that "[patentee] cannot have a patent for it because a patent cannot be awarded for a discovery or for a product of nature, or for a chemical element.").

103. Schering Corp. v. Gilbert, 153 F.2d 428 (2d Cir. 1946).

104. *Id.* at 429.

105. *Id.* at 430.

> vanced position cannot be maintained in the face of the patent statute and the multitude of authoritative decisions to the contrary.[106]

The court ultimately held that the claim to the new molecule was valid and that the molecule represented a new composition of matter.[107]

As is the case with any chemical compound, the molecule at issue in *Schering* was "the result of reactions which follow natural laws."[108] Busch's argument that transgenic plants and cells should not be patentable subject matter because they follow "laws of nature" is therefore an old argument which has been routinely and soundly rejected by courts throughout the history of American patent law. The highly restrictive application of the "law of nature" doctrine has been rejected by courts with respect to mechanical and chemical inventions; no persuasive argument exists for why the outcome should be any different with respect to plants.

IV. PATENTABILITY IS GOVERNED BY 35 U.S.C. §§ 101-103, NOT BY A SEPARATE "INVENTION" REQUIREMENT

The 1952 Patent Act established five criteria for patentability: (1) patentable subject matter;[109] (2) novelty;[110] (3) utility;[111] (4) nonobviousness;[112] and (5) adequate disclosure (which includes written description, enablement, and best mode).[113]

Busch argues in his essay that plants are not patentable because they are not "inventions." Busch, relying on pre-1952 case law, argues that whether or not something amounts to an "invention" is a separate requirement for patentability beyond novelty, utility, and statutory subject matter.[114] This argument mischaracterizes the case law, ignores the meaning of "inventor" in pre-1952 patent act cases, and also ignores section 103 of the 1952 Act, which, as argued further *infra*, replaced the judicially created "invention" standard with the statutory "nonobviousness" test.

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106. *Id.* at 432.
107. *Id.*
108. *Id.*
109. 35 U.S.C.A. § 101 (2006).
110. *Id.* § 102.
111. *Id.* § 101.
112. *Id.* at § 103. The *Graham* Court ultimately stated that the non-obvious standard of Section 103 "comports with the constitutional strictures" of the intellectual property clause. *Graham*, 383 U.S. at 17.
113. 35 U.S.C.A. § 112 (2006).
114. Busch, *supra* note 4, at 445-66.

The concept of "invention" was a judicially created doctrine describing the qualitative criteria for a patentable invention beyond mere novelty and utility.[115] In *Hotchkiss v. Greenwood*, the Supreme Court established for the first time a third patentability requirement, in addition to novelty and utility: the subject matter of the patent must be the product of "invention," and not the result of the skill "possessed by an ordinary mechanic acquainted with the business ...."[116] *Hotchkiss*, therefore, initiated what in pre-1952 patent law parlance came to be known as the "requirement for invention."[117] The cases cannot be interpreted to add yet another requirement beyond obviousness.

In *Hotchkiss*, the subject matter at issue was a cheaper and more durable door knob made of porcelain or clay.[118] The prior art taught how to make door knobs made out of metal or wood.[119] The Court held that the plaintiff's door knob was unpatentable, noting that "[t]he difference is formal, and destitute of ingenuity or invention."[120]

However, it was not until the 1870s that the "invention" standard was regularly applied by the courts as an additional requirement of patentability.[121] In 1869, the Supreme Court invalidated a patent on the basis that the subject of the patent "involved simply mechanical skill, which is not patentable" and "required no invention" over the prior art.[122] Thereafter, the "invention" standard, i.e. that the difference between the prior art and the invention must be beyond the skill of an ordinary mechanic, was applied routinely by the Supreme Court.[123] Many of the features which are associated with present day determinations of obviousness, such as the indicia which the court would later call "secondary considerations"[124] and disfavoring the use of hindsight in determining obviousness, began to appear in the Court's opinions.[125] The *Graham* Court referred to the *Hotchkiss* "general

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115. Hotchkiss v. Greenwood, 52 U.S. 248, 257 (1850).

116. *Id.* at 267.

117. *See* Giles S. Rich, *The Vague Concept of "Invention" as Replaced by Sec. 103 of the 1952 Act*, 46 J. PAT. OFF. SOC'Y 855, 860 (1964).

118. *Hotchkiss*, 52 U.S. at 264.

119. *Id.* at 265.

120. *Id.* at 266.

121. *See* Kenneth J. Burchfiel, *Revising the "Original" Patent Clause: Pseudohistory in Constitutional Construction*, 2 HARV. J. L. & TECH. 155, 207-08 (1989).

122. Stimpson v. Woodman, 77 U.S. 117, 121 (1869).

123. *See* Pearce v. Mulford, 102 U.S. 112 (1880); Atlantic Works v. Brady, 107 U.S. 192 (1882); Slawson v. Grand Street, P.P. & F.R. Co., 107 U.S. 649 (1883); Collar Co. v. Van Dusen, 90 U.S. 530 (1874); Reckendorfer v. Faber, 92 U.S. 347 (1875); Dunbar v. Myers, 94 U.S. 187 (1876).

124. *Graham*, 383 U.S. at 17-18.

125. *See, e.g.*, Smith v. Goodyear Dental Vulcanite Co., 93 U.S. 486, 499 (1876) (discussing the invention's long felt need and commercial success); Loom Co. v. Higgins, 105 U.S.

condition of patentability" as the "cornerstone of the judicial evolution suggested by Jefferson and left to the courts by Congress."[126]

Application of the *Hotchkiss* rule, however, proved to be difficult.[127] The *Hotchkiss* Court did not provide a means for determining if the subject matter was beyond the skill "of an ordinary mechanic acquainted with the business."[128] Moreover, the term "invention" was a vague and broad term, further complicating application of the test.[129]

By the late 1940s, dissatisfaction with the "invention" test led to multiple attempts to clarify or replace the test.[130] The desire for some change of the "invention" standard was at least part of the impetus for a new Title 35.[131]

Section 103 of the 1952 Act adopted the analytical framework initially set forth in *Hotchkiss*, requiring that the subject matter of the patent be compared to the prior art, with reference to one of ordinary skill in the relevant art.[132] As Judge Rich has explained, section 103 has accurately been described "as providing a '*condition* which exists in our law and has existed for more than 100 years . . . by reason of decisions of the courts.'"[133] The major difference between the original *Hotchkiss* test and section 103 was that Congress replaced the indefinite

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580, 591-92 (1881) (discussing the invention's long felt need and the use of hindsight); Magowan v. New York Belting & Packing Co., 141 U.S. 332, 343 (1891) (recognizing the invention's commercial success). For a more thorough discussion of these cases, *see* George M. Sirilla & Giles S. Rich, *35 U.S.C. ...103: From Hotchkiss To Hand To Rich, The Obvious Patent Law Hall-Of-Famers*, 32 J. MARSHALL L. REV. 437, 460-87 (1999).

126. *Graham*, 383 U.S. at 11.

127. Sirilla & Rich, *supra* note 124, at 461.

128. *See Hotchkiss*, 52 U.S. at 254.

129. Sirilla & Rich, *supra* note 124, at 442-43; s*ee also* Rich, *supra* note 117, 860-61 stating:

> This proliferation of views on what did and did not amount to 'invention' went on for 100 years. We were enlightened with the view that 'invention' resulted from the exercise of the 'inventive faculties' and other circular reasoning. Our standard text, Walker on Patents in its seventh or first Deller edition, said 'An invention is the result of an inventive act.'

130. Sirilla & Rich, *supra* note 124, at 442-43.

131. *Id.* at 443.

132. *See* Burchfiel, *supra* note 120, at 165; s*ee also* Rich, *supra* note 117, at 864, noting:

> What section 103 itself says is that what is patented must *not* have been *obvious* to one of *ordinary* skill *in the art involved*, at the *time* the invention was made. The parallel with what would be expected of the 'ordinary mechanic acquainted with the business' in the 'door-knob case' should be clear

133. Rich, *supra* note 117, at 864 (emphasis in original).

Hotchkiss language of "invention" with the "non-obviousness" language of section 103.[134]

The 1952 revisions to the patent statutes utilize the term "invention" in a variety of contexts. "Invention" is used in sections102 and 103 of the Patent Act in the context of an invention being anticipated or obvious over the prior art.[135] In section 101, "invention" is used to refer to the categories of patentable subject matter.[136]

Pasquale Federico, one of the authors of the 1952 Act, has commented that one of the intentions of the 1952 Act was to make clear that the term "invention" refers to both patentable inventions and those that do not meet the requirements of novelty and nonobviousness.[137] Discussing the pre-1952 Act meaning of the term "invention", the Court of Customs and Patent Appeals has stated:

> The problem of accurate, unambiguous expression is exacerbated by the fact that prior to the Patent Act of 1952 the words "invention," "inventive," and "invent" had distinct legal implications related to the concept of patentability which they have not had for the past quarter century. Prior to 1952, and for sometime thereafter, they were used by courts in imputing Patentability. Statements in the older cases must be handled with care lest the terms used in their reasoning clash with the reformed terminology of the present statute; lack of meticulous care may lead to distorted legal conclusions.
>
> The transition made in 1952 was with respect to the old term "invention," imputing Patentability, which term was replaced by a new statutory provision, s 103, requiring Nonobviousness, as is well explained and approved in Graham v. John Deere Co. ...[138]

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134. Sirilla & Rich, *supra* note 124, at 521-2.

135. 35 U.S.C. §§ 102-03 (1952).

136. 35 U.S.C. § 101 (1952).

137. Federico, *supra* note 36, at 178. It should also be noted that section 103 counteracted the somewhat rogue "flash of creative genius" test which some courts had used in applying the invention test. Judge Rich has explained:

> Following a phrase causally dropped by the Supreme Court in *Cuno v. Automatic*, in 1941, that 'the new device, however useful it may be, must reveal the flash of creative genius,' some courts took off on a quest for such a flash and, not finding it, invalidated patents. The last sentence of section 103 stopped this abruptly with the legislative command: 'Patentabiliy shall not be negatived by the manner in which the invention was made.'

Rich, *supra* note 117, at 867-68.

138. *Application of Bergy*, 596 F.2d 952, 959 (C.C.P.A. 1979) (*vacated in part* on other grounds).

Judge Rich has also pointed out that inventors make two kinds of inventions- those that are patentable, and those that are not. In a 1978 Journal of Patent and Trademark Society article, Judge Rich stated:

> Now and then, in my early years on the court, a lawyer would argue that the subject matter of the application on appeal should be patentable because it truly was an invention or, contrariwise, that it was not patentable because it was not an invention, but we rarely hear such arguments any more. If we do, we simply remind counsel that the issue is not whether there is an invention-*there is always an invention*-and that the issue is its *patentability*, which turns on compliance with the statute, which says nothing about *being* an invention.[139]

According to Judge Rich, one of the purposes of section 103 was to clarify the difference between patentable and unpatentable inventions.[140]

Judge Hand has stated that section 103 of the 1952 Act restored the original *Hotchkiss* test.[141] Equally significant, Judge Hand further acknowledged that it was not for the courts to decide which discoveries "promote the progress of science and the useful arts."[142] Judge Hand stated:

> That was in 1945, while the test laid down in Hotchkiss v. Greenwood still had a nominal authority, of which little remained in actual application. We still cannot escape the conclusion-as we could not when Lyon v. Bausch & Lomb Optical Co., supra, was decided in 1955-that Congress deliberately meant to restore the old definition, and to raise it from a judicial gloss to a statutory command. It is not for us to decide what 'discoveries' shall 'promote the progress of science and the useful arts' sufficiently to grant any 'exclusive right' of inventors (U.S. Constitution, Article I, § 8). Nor may we approach the interpretation of § 103 of the Title 35 with a predetermined bias.[143]

Accordingly, there can be little doubt that once the requirements of section 103 have been complied with, there is, as Judge Rich has stated, "no further and different requirement called 'invention'; that compliance with [section] 103 is the policy judgment of Congress on how to bring the invention within the Constitutional purpose."[144] The inquiry therefore ends with Congressional exercise of

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139. Giles S. Rich, *Escaping the Tyranny of Words: Is Evolution in Legal Thinking Impossible*?, 60 J. PAT. & TRADEMARK OFF. SOC'Y 271, 278 (1978) [hereinafter *Tyranny of Words*] (emphasis in original); *see also* Rich, *supra* note 117, at 862 (stating "[h]undreds of 'real' or 'true' inventions, all resulting from 'inventive acts' and the exercise of the 'inventive faculties,' are held unpatentable every day for lack of novelty.").

140. *See Tyranny of Words*, *supra* note 139, at 281.

141. Reiner v. I. Leon Co., 285 F.2d 501, 503 (2d Cir. 1960).

142. *Id.*

143. *Id.*

144. Rich, *supra* note 117, at 875.

the necessary and proper power in passing the statutes. It is not for the courts to add criteria or exclusions beyond those enumerated by Congress.

V. PLANTS AS PATENTABLE SUBJECT MATTER IS GOOD PUBLIC POLICY

Busch proposes in his article that an entire class of inventions, namely genetically modified plants, should be denied the same protection of the patent system which is afforded other inventions in other technical areas.[145] This suggestion not only runs afoul of section 101 as it was drafted by Congress and has been interpreted by the Supreme Court, but is also bad public policy. Important inventors such as Thomas Edison have recognized the unfairness of discriminating against one particular class of inventors over another.[146] Edison, writing in support of the Plant Patent Act, stated "[n]othing that Congress could do to help farming would be of greater value and permanence than to give to the plant breeder the same status as the mechanical and chemical inventors now have through the patent law."[147] Luther Burbank, a famous plant breeder, also spoke of the importance of an incentive system for plant breeders:

> I despair of anything being done at present to secure to the plant breeder any adequate returns for his enormous outlays of time, energy, and money. A man can patent a mousetrap or copyright a nasty song, but if gives to 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.[148]

The number of means by which society is benefited by the development and cultivation of plants is immense. Everything from food to shelter, medicine and artistic beauty, to name just a few of the more obvious examples, is contributed to society by plants. Indeed, without them, civilization would not exist as we presently know it. Why then, shouldn't their inventors be rewarded in as much the same way as the inventors of new machines, compounds, or processes? As the Court stated in its now famous quotation, patentable subject matter covers "anything under the sun that is made by man."[149]

The encouragement of invention in the areas of agriculture, commerce, and manufacturing was also advocated by George Washington:

> . . . The advancement of Agriculture, Commerce and Manufactures, by all proper means, will not, I trust, need recommendation. But I cannot forbear intimating to

145. *See* Busch, *supra* note 4, at 390.
146. Hearings on H.R. 11372 Before the House Comm. On Patents, 71st Cong. 3, at 2 (1930).
147. *Id.*
148. *Id.*
149. *Chakrabarty*, 447 U.S. at 309.

> you the expediency of giving effectual encouragement as well to the introduction of new and useful inventions from abroad, as to the exertions of skill and genius in producing them at home . . .[150]

Thomas Jefferson also placed considerable value on the role of plants to a society, noting that "[t]he greatest service which can be rendered any country is to add a useful plant to its culture."[151]

The short history of the United States demonstrates the correctness of Jefferson and Washington's views.[152] By the mid-1840s, the U.S. Patent Office was engaged in a program to distribute a large amount of seeds and plants to farmers.[153] These farmers, attempting to "improve the land races" (crop varieties), screened out the seed lines which performed poorly and saved those which performed well.[154] In 1862, Congress formed the Department of Agriculture, with the given charter to "'procure, propagate, and distribute among the people *new and valuable* seeds and plants.'"[155] By the end of the 19th century the Department of Agriculture had distributed over 1.1 billion packets of seed to farmers.[156]

Yields of the major crops in the United States have increased dramatically since the conclusion of the Department of Agriculture's seed distribution program. From 1930 to the mid-1990s, corn yields have increased from 20 bushels per acre to 140 bushels per acre, cotton yields have nearly quadrupled, soybean yields more than tripled, and wheat yields increased by more than 2.5 times.[157] Genetic improvements achieved by plant breeders account for more than half of these yield increases.[158] Perhaps the most significant innovation, particularly for corn, was the development of hybrid crops in the 1930s.[159] Today, agricultural biotechnology is facilitating the development of innovations in crop seed through the use of genetic engineering.[160]

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150. *Proceedings in Congress During the Years 1789 and 1790, Relating to the First Patent and Copyright Laws: George Washington's Address to First Congress, 2nd Session* (Jan. 8, 1790), *reprinted in* 22 J. PAT. & TRADEMARK OFF. SOC'Y 243, 253 (1940).

151. Thomas Jefferson, 1800, Memorandum of Services, Writings

152. Or, as Justice Holmes famously noted, "a page of history is worth a volume of logic." N.Y. Trust Co. v. Eisner, 256 U.S. 345, 349 (1921).

153. David R. Nicholson, *Agricultural Biotechnology and Genetically-Modified Foods: Will the Developing World Bite?*, 8 VA. J.L. & TECH. 7, 9 (2003).

154. *Id.*

155. *Id.*

156. *Id.*

157. FERNANDEZ-CORNEJO, *supra* note 17, at 5-6.

158. *Id.*

159. *Id.* at 2-3, 6.

160. *Id.* at 5.

The continued development of agriculture and plants is important to the present and future. Agricultural biotechnology can help solve many pressing issues facing the global community, such as food shortages and decreases in biodiversity.[161] Further, advances in agriculture can help increase crop yields, preserve the environment by decreasing the reliance on pesticides, fungicides and insecticides, and increase the nutrient value of various crops.[162] The development of "stress-tolerant plants" will benefit agriculture production in areas of the world with high stress levels, such as areas suffering from high soil salinity or draught.[163] Increased agricultural productivity also results directly in an increase in economic growth in developing countries.[164]

There are many present day examples of large agricultural companies and public institutions using their technology and intellectual property in order to assist the global agricultural community. Increasingly, owners of intellectual property rights in agricultural biotechnology have been sharing their proprietary rights in agricultural products and processes with developing countries. For example, the initial distribution of golden rice (rice containing Vitamin A) was delayed due to the presence of potentially seventy patents owned by thirty-two different companies and universities.[165] Then, in 2001, the Rockefeller Organization announced that five major companies had donated royalty free intellectual property licenses in order to facilitate the availability of golden rice to developing countries.[166]

The University of California also recently negotiated an agreement with the International Rice Research Institute ("IRRI").[167] This agreement allows the IRRI to distribute to developing countries rice cultivars containing the cloned Xa21 gene, which confers resistance to one of the most serious bacterial rice diseases in Asia and Africa.[168] The countries may then distribute the cultivars to farmers, without having to pay a royalty to the University of California.[169]

There are also numerous public and private institutions whose goal is to assist the worldwide agricultural community in accessing agricultural technology

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161. Mary Lynne Kupchella, Note, *Agricultural Biotechnology: Why it Can Save the Environment and Developing Nations, But May Never Get A Chance*, 25 WM. & MARY ENVTL. L. & POL'Y REV. 721, 721 (2001).

162. *Id.*

163. *Id.* at 276.

164. Haley Stein, Note, *Intellectual Property and Genetically Modified Seeds: The United States, Trade, and the Developing World*, 3 NW. J. TECH. & INTELL. PROP. 160, ¶ 61 (2005).

165. Ronald P. Cantrell et al., *The Impact of Intellectual Property on Nonprofit Research Institutions and the Developing Countries They Serve*, 6 MINN. J. L. SCI. & TECH. 253, 269 (2004).

166. *Id.* at 270.

167. *Id.* at 275.

168. *Id.*

169. *Id.*

and intellectual property related to agricultural technology. For example, the Public Intellectual Property Resource for Agriculture ("PIPRA") is a partnership whose purpose is to help the "'public sector agricultural resource institutions [in] achiev[ing] their public mission by ensuring access to intellectual property to develop and distribute improved staple and specialty crops.'"[170] PIPRA works with the USDA and multiple foreign agencies to create a database of intellectual property related to agricultural technology which public researchers can access in order to determine who presently holds patents in which areas of research.[171]

While agricultural biotechnology promises to result in multiple new and useful varieties and products, plant breeders and seed companies have multiple hurdles to overcome prior to, and after, marketing a new variety. The development of a new plant variety requires huge expenditures of time, money, and resources. A new hybrid variety can take anywhere from ten to fifteen years to develop and be market-ready.[172] Thousands of crosses between multiple plants may have to be made, recorded, and then tested, without any guarantee of success.[173] One report from the 1980s estimated that the cost to develop a new variety ranged between two and two and a half million U.S. dollars.[174] Because of the large amount of time and money required to develop a new plant variety, a strong system of intellectual property protection is crucial in order to ensure that agricultural input companies recoup their research investments and continue to create new agricultural products. Without the protection of intellectual property that exists in the United States, it is unlikely that the seed industry would have made such large investments.[175]

Agricultural economic studies have indicated the need for an incentive system in order to continue to stimulate research and development as well as new agricultural products.[176] It is not surprising then that, as a recent study illustrates, the interests of both agricultural firms and consumers are largely complimentary with respect to intellectual property protection for plants.[177] As the Supreme Court has noted, "[t]he economic philosophy behind the clause empowering Congress to grant patents and copyrights is the conviction that encouragement of

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170. Stein, *supra* note 163, at ¶ 67.

171. PIPRA-Activities, http://www.pipra.org/main/activities.htm#2 (last visited Oct. 23, 2006).

172. FERNANDEZ-CORNEJO, *supra* note 17, at 44-46.

173. H.R. Rep. No. 96-1115, at 4 (1980), *reprinted in* 1980 U.S.C.C.A.N. 6954, 6956.

174. FERNANDEZ-CORNEJO, *supra* note 17, at 44-46.

175. *Id.*

176. *See* Sergio H. Lence et al., *Welfare Impacts of Intellectual Property Protection In The Seed Industry*, 87 AM. J. AGRIC. ECON. 951, 951 (2005).

177. *See id.*

individual effort by personal gain is the best way to advance public welfare through the talents of authors and inventors in 'Science and useful Arts.'"[178]

A further hurdle which agricultural output supplies must face is the fact that many innovations in agriculture are often easily appropriated by a company's competitors. The time, research expenditures, and innovation which went into developing and marketing the new product may be undercut due to the accessibility of the invention.[179] For example, the genetics responsible for a particular trait contained in a new variety may be appropriated by a competitor and placed into their own product lines.[180] Intellectual property protection is therefore crucial in order for agricultural and seed companies to assert property rights in their inventions and thereby maintain the incentives for continued innovation.[181]

As Abraham Lincoln noted, the patent system "added the fuel of interest to the fire of genius."[182] This needs to be as true for botanists, biologists and plant inventors as anyone else. As history has illustrated with golden rice, societal and political motives can be merged to promote general public benefit, at times even at the sacrifice of profit motive.

178. Mazer v. Stein, 347 U.S. 201, 219 (1954).
179. FERNANDEZ-CORNEJO, *supra* note 17, at 18.
180. *Id.*
181. *Id.* at 18
182. Abraham Lincoln, Second Lecture on Discoveries and Inventions at Jacksonville, Illinois (Feb. 11, 1859).