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Keep the License Agreements Coming: The Effects of *J.E.M. Ag Supply, Incorporated v. Pioneer Hi-Bred International, Incorporated* on Universities' Use of Intellectual Property Laws to Protect Their Plant Genetic Research

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KEEP THE LICENSE AGREEMENTS COMING:
THE EFFECTS OF
J.E.M. AG SUPPLY, INCORPORATED V.
PIONEER HI-BRED INTERNATIONAL, INCORPORATED
ON UNIVERSITIES' USE OF INTELLECTUAL PROPERTY
LAWS TO PROTECT THEIR PLANT GENETIC
RESEARCH

INTRODUCTION

Some universities and professors invest scarce resources in researching plant genetics. These universities and professors need to be aware of patent laws to protect their investments and resulting discoveries, as well as to avoid infringing on others' patents.¹ Further, being well-versed in the law will allow universities to better understand their options when they negotiate licensing and settlement agreements.

Intellectual property (IP) in the plant genetic field has become an important issue—not just to universities—but to governments, farmers, and corporations around the world. There are at least two reasons for this. First, we are globally interconnected more than ever before and overseas markets are

1. Goldie Blumenstyk, *U. of Rochester Risks Millions in Patent Fight with Pharmaceutical Giants*, Chron. of Higher Educ. (Sept. 20, 2002) (for example, a University of Rochester professor, Dr. Young, filed his first patent in 1992 and is now engaged in a high-stakes infringement suit. “Dr. Young says he didn’t quite appreciate how complicated and contentious the process could be. For a brief moment, in fact, he even considered not using a lawyer at all. ‘I thought it was so easy that maybe I should do it myself—that you wrote to the patent office and they sent you a form,’ he recalls.”). See generally Goldie Blumenstyk, *Universities Try to Keep Inventions From Going ‘Out the Back Door’: To Keep Hold of Lucrative Licenses, Institutions Educate, Cajole, and Sometimes Sue*, Chron. of Higher Educ. (May 17, 2002) (“[P]rofessors may not realize that the university might also claim inventions developed during consulting, if the invention overlaps with their university work.” Further, universities certainly have a financial incentive to educate their researchers and track university research projects to prevent researchers from “going over the wall” or going “out the back door” to patent and license their inventions.); *U. of W.Va. Bd. of Trustees v. Vanvoorhies*, 278 F.3d 1288 (W.Va. 2002).

important to United States corporations. Second, plant genetic research is advancing rapidly; thus, we are compelled to promptly enact laws to govern new biotechnologies such as plant gene transfer.

New biotechnologies lead to cases of first impression arising in the court system. In 2001, the United States Supreme Court decided *J.E.M. Ag Supply, Incorporated v. Pioneer Hi-Bred International, Incorporated (J.E.M.)*.² Clarifying an important question, the Court held that plant varieties may be patented under the utility patent statute³ and that the Plant Patent Act⁴ (PPA) and Plant Variety Protection Act⁵ (PVPA) are not the sole means of patenting plant varieties.⁶ The Court's holding clarified an ambiguity that affected both universities and corporations that engage in plant breeding and plant genetic research.

This comment will first provide a general overview of the three means by which plant-inventions can be protected: the general utility patent, the PPA, and the PVPA. The comment will then discuss what factors affected the outcome of the *J.E.M.* case and conclude with a discussion of the importance of plant-related patents to United States universities. The primary question this comment addresses is what impact will the *J.E.M.* case have on universities involved in plant genetic research? As will be discussed, universities are finding a new source of revenue as well as a new source of liability in the proliferation of intellectual property from plant genetic research.

I. THREE TYPES OF IP PROTECTION FOR PLANTS

Patent law is meant to provide incentive for people and companies to invest in research and product development.⁷

2. 534 U.S. 124 (2001) (hereinafter, the parties are abbreviated in the text as "J.E.M." and "Pioneer").

3. 35 U.S.C. § 101 *et seq.* (2000).

4. 35 U.S.C. § 161 *et seq.* (2000).

5. 7 U.S.C. § 2321 *et seq.* (2000).

6. *J.E.M.*, 534 U.S. at 145.

7. "The patent laws promote this progress [of science] by offering inventors exclusive rights [i.e., a monopoly] for a limited period as an incentive for their inventiveness and research efforts." *Diamond v. Chakrabarty*, 447 U.S. 303, 307 (1980) (quoting *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 480-481 (1974); *Universal Oil Co. v. Globe Co.*, 322 U.S. 471, 484 (1944)).

The *J.E.M.* case affirmed the lower court's holding that plants are patentable subject matter under the utility patent statute as well as the PPA and the PVPA. This section briefly compares and contrasts these three IP schemes.⁸

A. General Utility Patents

The Constitution gives Congress power “[t]o promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.”⁹ Building on the Constitutional language, Thomas Jefferson authored the Patent Act of 1793.¹⁰ Jefferson’s language laid the foundation for what has become Title 35 of the United States Code section 101, which provides for the issuance of utility patents. The statute states that “[w]hoever 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 therefore, subject to the conditions and requirements of this title.”¹¹

The utility patent applicant must provide a “specification”¹² that contains a “clear” and “concise” written description of the invention sufficiently detailed “as to enable any person skilled in the art to which it pertains . . . to make and use the same.”¹³ In addition, the specification “shall set forth the best mode contemplated by the inventor of carrying out his invention.”¹⁴ To obtain a utility patent, the applicant must show that the plant is “new, useful, and nonobvious.”¹⁵ If the applicant seeks a utility patent for a plant, he or she must include a reasonable

8. For more in-depth coverage of these three schemes, see generally Elisa Rives, *Mother Nature and the Courts: Are Sexually Reproducing Plants and Progeny Patentable under the Utility Patent Act of 1952*, 32 *Cumb. L. Rev.* 187 (2001-2002).

9. U.S. Const. art. I, § 8. For a more developed history of laws and cases affecting the patentability of plants, see Nancy J. Linck, *Patentable Subject Matter Under Section 101—Are Plants Included?*, 67 *J. of the Pat. & Trademark Off. Socy.* 489, 489-496 (Sept. 1985).

10. *Chakrabarty*, 447 U.S. at 308.

11. 35 U.S.C. § 101 (2002). See Act of Feb. 21, 1793, § 1, 1 Stat. 319 (Jefferson authored the Patent Act of 1793 in which he defined § 101 subject matter as “any new and useful art, machine, manufacture, or composition of matter, or any new or useful improvement [thereof]”) (quoted in *Chakrabarty*, 447 U.S. at 308).

12. 35 U.S.C. § 111(a)(2)(A) (2000).

13. 35 U.S.C. § 112 (2000).

14. *Id.*

15. *J.E.M.*, 534 U.S. at 142 (citing 35 U.S.C. §§ 101-103).

plant description, which generally means that the applicant must submit a deposit of the biological material, e.g., seeds, plant tissue cells, etc., in a designated repository where the material will be publicly available.¹⁶ These requirements exceed those found in the PPA or the PVPA.

Utility patents provide broad rights to the patent holder, including the right to file multiple claims¹⁷ and the right to prevent others from making or even using the invention¹⁸ during a twenty-year term.¹⁹ In patent infringement cases, the utility patent allows the patent holder to receive “damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court.”²⁰

Compared to alternative patenting schemes, the utility patent requires more applicant input (e.g., detailed written description of the invention), but it also provides heightened protections. Seed companies like Pioneer rely on the utility patent’s protection against saving seed. For example, if seed is patented and licensed under the utility patent, the purchasing farmer may not save seed for reuse on the farm the next year.²¹ Rather, in most cases, the farmer must buy more seed each year.

16. *Id.* See 37 C.F.R. §§ 1.801-1.809 (2001) (regarding disclosure by persons seeking to patent biological material under the utility patent statute).

17. 35 U.S.C. § 112 (2000) (“The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.”).

18. The utility patent includes:

the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States or importing the invention into the United States, and, if the invention is a *process*, . . . the right to exclude others from using, offering for sale or selling throughout the United States, or importing into the United States, products made by that process.

35 U.S.C. § 154(a)(1) (original language adopted in Act of April 10, 1790) (*italics added*).

19. 35 U.S.C. § 154(a)(2) (2000).

20. 35 U.S.C. § 284 (2000).

21. *Monsanto Co. v. McFarling*, 302 F.3d 1291, 1299 (2002) (Monsanto sued McFarling, a farmer, for patent infringement of Roundup Ready soybeans. The license agreement prohibited the farmer from saving seed for replanting. Citing *J.E.M.*, the court held that “the right to save seed of plants registered under the PVPA does not impart the right to save seed of plants patented under the [general utility] Patent Act.”).

The utility patent is the most expensive form of protection; however, the protection is broader than PPA protection because the utility patent applies to “anything under the sun that is made by man”²² while the PPA and PVPA apply only to certain new plant *varieties*.²³

B. Plant Patent Act

In 1930, Congress passed the PPA, which specified that asexually-reproduced plants are proper subject matter covered by section 101 (the utility patent statute).²⁴ In 1952, the PPA provisions were moved to section 161 *et seq.*²⁵ Under the PPA, the patent holder has the right to exclude others from asexually reproducing the plant, and from using, offering for sale, or selling the plant so reproduced, or any of its parts, throughout the United States, or from importing the plant so reproduced, or any parts thereof, into the United States.²⁶

The PPA protects only plants reproduced by vegetative propagation (i.e., asexual reproduction), including cuttings, budding, and grafting.²⁷ This category “include[s] many ornamental plants for landscaping, certain vegetable and fruit species and certain [turfgrasses].”²⁸ To protect against

22. *Chakrabarty*, 447 U.S. at 309 (quoting Sen. Rep. 82-1979, at 5 (1952); H.R. Rpt. 82-1923, at 6 (1952) (statement made by P.J. Frederico, a principle draftsman of the 1952 Act, *Hearings on H.R. 3760 before Subcommittee No. 3 of the House Committee on the Judiciary*, 82d Cong., 1st Sess., 37 (1951) (quoting *Johnson v. Johnson*, 60 F. 618, 620 (W.D.Pa. 1894))). See generally Linck, *supra* n. 9, at 493.

23. 35 U.S.C. § 161 (2002) (“Whoever invents or discovers and asexually reproduces any distinct and new *variety* of plant . . . may obtain a patent therefore. . .”) (italics added). See 7 U.S.C. § 2402(a) (2000) (PVPA provision).

24. 35 U.S.C. § 161 (2002) (provides: “Whoever invents or discovers and asexually reproduces any distinct and new variety of plant, including . . . hybrids . . . , may obtain a patent therefore, subject to the conditions and requirements of this title.”).

25. *J.E.M.*, 534 U.S. at 133.

26. 35 U.S.C. § 163 (2000).

27. Web Garden, Ohio Master Gardener Program, Ohio St. U. Extension, <<http://www.hcs.ohio-state.edu/mg/manual/prop2.htm>> (accessed Dec. 26, 2002); see Rives, *supra* n. 8, at 199 (“The PPA provides the plant breeder patent protection to a single claimed plant with a unique characteristic, either physiological or anatomical, that can be cloned by grafts, buds, or cuttings, resulting in a new plant with the same characteristic.”) (citing Andrew F. Nilles, *Plant Patent Law: The Federal Circuit Sows the Seeds to Allow Agriculture to Grow*, 35 Land & Water L. Rev. 355, 361 (2000)).

28. E-mail from Robert R. Fincher, Dir., Tech. Commercialization Off., U. of Ga., to Timothy P. Daniels (Oct. 22, 2002) (copy on file with Mr. Daniels).

infringement, the PPA was amended in 1998 to include “plant parts.”²⁹

Generally, applicants for section 161 plant patents must meet the same requirements as section 101 applicants.³⁰ Diverting from the utility patent provisions, however, PPA grants are limited to one claim only,³¹ and the PPA description need only be “as complete as is reasonably possible.”³²

C. Plant Variety Protection Act

In 1970, Congress passed the PVPA, which generally provided that developers of sexually reproduced plant variety could obtain a PVP certificate through the Plant Variety Protection Office.³³ The applicant must show that the plant variety is new, distinct, uniform, and genetically stable.³⁴ Further, the applicant must deposit some of the protected seed in a public depository, though “neither the [PVPA] statute [Title 7 of the United States Code section 2422(4)] nor the applicable regulation mandates that such material be accessible to the general public during the term of the PVP certificate.”³⁵ PVPA protection “is designed for particular types of plants that require the ability to sexually reproduce [via pollen, seeds, etc.] on a large scale in order to be commercially valuable.”³⁶

29. Pub. L. 105-289, § 2, 112 Stat. 2780 (Oct. 27, 1998) (provided that: “(a) Findings. - The Congress makes the following findings: . . . (3) Plant parts produced from plants protected by United States plant patents are being taken from illegally reproduced plants and traded in United States markets to the detriment of plant patent holders. (4) Resulting lost royalty income inhibits investment in domestic research and breeding activities associated with a wide variety of crops Such research is the foundation of a strong horticultural industry. (5) Infringers producing such plant parts from unauthorized plants enjoy an unfair competitive advantage over producers who pay royalties on varieties protected by United States plant patents.”)

30. 35 U.S.C. § 161 (2000) (“The provisions of this title relating to patents for inventions shall apply to patents for plants, except as otherwise provided.”). See *J.E.M.*, 534 U.S. at 133 (“To obtain a plant patent under § 161 a breeder must meet all of the requirements for § 101, except for the description requirement.”).

31. *Imazio Nursery, Inc. v. Dania Greenhouses*, 69 F.3d 1560, 1564 (2d Cir. 1995) (“Only a single claim is permitted in a plant patent.” (citing 37 C.F.R. § 1.164; *Manual of Patent Examining Procedure (MPEP)* § 1605 (Rev. 14, Nov. 1992))).

32. 35 U.S.C. § 162 (2000).

33. 7 U.S.C. § 2402 (2000).

34. 7 U.S.C. § 2402 (2000).

35. *J.E.M.*, 534 U.S. at 143; see 7 C.F.R. 97.6 (2001).

36. S. Ct. Oral Argument at 4-5, *J.E.M.* (No. 99-1996) (Oct. 3, 2001) (available at 2001 WL 1196195).

The primary provisions of the PVPA are as follows: The PVPA prohibits marketing a protected variety but allows breeding (making crosses) with the protected variety.³⁷ Though the PVP holder can prevent others from selling the protected seed and thus stop commerce, she cannot stop people from using the protected seed to make other hybrids.³⁸ The PVPA protects not only the specific protected variety but also essentially derived varieties.³⁹ The PPA and utility patent statute do not exempt saving seed for use on the farm.⁴⁰ Under the PVPA, however, a farmer may “raise a crop one year [and] save seed to use for himself the next year.”⁴¹ The PVPA also includes an exemption for research.⁴²

37. 7 U.S.C. § 2541(a) (2000) (the PVPA states that without express permission, no one may: “(1) sell or market the protected variety, or offer it or expose it for sale, deliver it, ship it, consign it, exchange it, or solicit an offer to buy it, or any other transfer of title or possession of it; (2) import the variety into, or export it from, the United States; (3) sexually multiply, or propagate by a tuber . . . , the variety as a step in marketing (for growing purposes) the variety; (4) use the variety in producing (as distinguished from developing) a hybrid or different variety therefrom.”)

38. E-mail from Robert R. Fincher, Dir., Tech. Commercialization Off., U. of Ga., to Timothy P. Daniels (Dec. 16, 2002) (copy on file with Mr. Daniels) (Dr. Robert Fincher notes, “[U]niversities primarily rely on Plant Patents and PVP [certificates] for protecting their plants. I don’t believe many universities are filing utility patents on plants unless the plant claim is part of a set of claims to a transgenic modification of plants.”).

39. 7 U.S.C. § 2541(c)(1) (2000) (“[a]n essentially derived variety (EDV) is a variety that is (1) ‘predominantly derived from another [initially protected] variety,’ (2) ‘clearly distinguishable from the initial [protected] variety,’ and (3) except for differences that result from the act of derivation, conforms to the initial variety in the expression of the essential characteristics that result from the genotype or combination of genotypes of the initial variety except for differences that result from the act of derivation, conforms to the initial variety in the expression of the essential characteristics that result from the genotype or combination of genotypes of the initial [protected] variety.”); 7 U.S.C. § 2401(a)(3) (2000).

40. Telephone Interview with Richard S. Cahoon, Cornell U. Pat. & Tech. Mktg. (Nov. 5, 2002).

41. S. Ct. Oral Argument at 5, *J.E.M.* (No. 99-1996) (Oct. 3, 2001) (2001 WL 1196195) (Original statement was a question.). See 7 U.S.C. § 2543 (2002).

Saving seed has a long and significant history. Inbreeding crops such as wheat or soybeans pollinate themselves; genetically, the seed of inbreeding crops produces an exact clone of the parent plant, commonly called “true-to-type” reproduction. Before seeds were patented under section 101, farmers purchased non-patented seed from a breeder such as Pioneer. After growing the crops, the farmer would save some seed (“bin-run seed”) for replanting the next season and sell the rest on the market. As long as the farmer could legally save seed, he did not need to return to the breeder and buy more.

On the other hand, hybrid-seed crops, such as corn, do not reproduce true-to-type. Rather, there is genetic variation in the “F2” generation. If the farmer tried to save and replant seed produced by hybrid “F1” plants, he would end up with a non-

Compared to the utility patent statute, the PVPA provides very low-level protection. In fact, the PVPA system has been described as being “almost a registration system . . . [in which] you fill out a form, and it’s granted without any kind of a rigorous examination as utility patents undergo in the United States.”⁴³ Due to recent advances in biotechnology, the PPA and PVPA are often deemed insufficient protection because they protect plant varieties from being marketed by unauthorized parties but they do not protect unauthorized parties from using the genes in those varieties in the development of new varieties.⁴⁴ One practitioner noted that “any plant-related gene patent, seed component patent, transformation patent or plant improvement patent would not qualify for PVP [protection] and therefore require a patent or trade secret status for effective protection.”⁴⁵ Researchers sometimes seek to patent a process or plant trait—not a *variety*—so the PPA and PVPA would be unsuitable means of protection. In passing the PVPA, Congress intended “to afford adequate encouragement for research and for marketing when appropriate, to yield for the public the benefits of new varieties.”⁴⁶

Since patents can be costly, researchers must do a cost-benefit analysis when deciding what level of IP protection to

uniform crop. Interview with Jeff Maughan, Assoc. Prof., Dept. of Plant & Animal Sci., B.Y.U. (Dec. 3, 2002). “Thus, a farmer who wishes to continue growing hybrid plants generally needs to buy more hybrid seed.” *J.E.M.*, 534 U.S. at 128.

42. 7 U.S.C. § 2544 (2000) (“The use and reproduction of a protected variety for plant breeding or other bona fide research shall not constitute an infringement of the protection provided under this chapter.”).

43. S. Ct. Oral Argument at 26, *J.E.M.* (No. 99-1996) (Oct. 3, 2001) (available at 2001 WL 1196195).

44. Br. of Amicus Curiae Am. Intellectual Property Law Assn. in Support of Respt. Supporting Affirmance at 4, *J.E.M.*, 534 U.S. 124 (2001) (available at 2001 WL 649829) (“Today, the scope of subject matter relating to plants that can meet the requirements of section 112 far exceeds single plant varieties, as defined by either the PPA or the PVPA. In contrast, the protection afforded by plant patents and PVPA certificates extends only to plant ‘varieties.’”).

45. E-mail from John Grace, Germplasm Licensing Coord., Pioneer Hi-Bred Intl., Inc., to Timothy P. Daniels (Jan. 7, 2003) (copy on file with Mr. Daniels).

46. 7 U.S.C. § 2581 (2000) (“Constitutional clauses 3 and 8 of article 1, section 8 are both relied upon.”); see Janice M. Strachan, *Plant Variety Protection: An Alternative to Patents*, <<http://warp.nal.usda.gov/pgdic/Probe/v2n2/plant.html>> (accessed Nov. 16, 2002) (Janice M. Strachan, a Senior Examiner at the Plant Variety Protection Office, suggests that the intent of the PVPA was to “encourage the development of novel varieties of sexually reproduced plants’ by providing their owners with exclusive marketing rights of them in the United States.”).

seek, if any. Utility patents generally cost between \$10,000 and \$20,000. Thus, universities tend to use the utility patent only when they want to protect a very valuable discovery. Plant patents generally cost between \$5,000 and \$10,000.⁴⁷ PVP certificates cost approximately \$3,000, including fees for the application, examination, and certificate.⁴⁸ For universities that have tight budgets and little confidence in the commercial value of a new plant variety, the PVPA provides an economical level of IP protection.⁴⁹

II. OVERVIEW OF *J.E.M. AG SUPPLY, INCORPORATED V. PIONEER HI-BRED INTERNATIONAL, INCORPORATED*

The issues involved in *J.E.M. Ag Supply, Incorporated v. Pioneer Hi-Bred International, Incorporated* have been brewing for decades. Before 1930, plant breeders' patent applications were rejected by the United States Patent & Trademark Office (USPTO) for two reasons: (1) The applications lacked a sufficient written description of the plant to be patented, and (2) plants were considered "product[s] of nature,"⁵⁰ even though humans clearly interfered with nature in the breeding process. In 1930, Congress passed the PPA "to get over the two historical hurdles of section 112, [the] written description requirement and the so-called product of nature doctrine."⁵¹

In 1980, the Court decided *Diamond v. Chakrabarty*.⁵² The issue in *Chakrabarty* was whether a human-engineered bacterium could receive utility patent protection. The particular bacterium in question was commercially valuable because it was "capable of breaking down multiple components of crude oil"—a property "which [was] possessed by no

47. Cahoon, *supra* n. 40.

48. Plant Variety Protection Off., *General Information*, <[http://www.ams.usda.gov/science/pvpo/pvp.htm#What is the total cost of protection?](http://www.ams.usda.gov/science/pvpo/pvp.htm#What%20is%20the%20total%20cost%20of%20protection?)> (accessed Nov. 9, 2002).

49. E-mail from Jeff Maughan, Assoc. Prof., Dept. of Plant & Animal Sci., B.Y.U. (former corporate researcher), to Timothy P. Daniels (Nov. 20, 2002) (copy on file with Mr. Daniels) (compared to holding a utility patent, "holding only a PVP certificate or PPA patent may be construed as a weaker negotiating stance—but it nonetheless provides the necessary legal protection that mandates that both parties come to an amicable licensing/royalty agreement prior to commercialization of the product.").

50. *J.E.M.*, 534 U.S. at 134 (citing *Chakrabarty*, 447 U.S. at 311–312).

51. S. Ct. Oral Argument at 28, *J.E.M.* (No. 99-1996) (Oct. 3, 2001) (available at 2001 WL 1196195).

52. *Chakrabarty*, 447 U.S. at 305.

naturally occurring bacteria.”⁵³ Here, the Court held that living things were patentable under section 101 if they were of human derivation.⁵⁴

J.E.M. presented a different question—whether the PPA and PVPA preempted section 101 in relation to protecting plants, and thus made general utility patents unavailable to new plant varieties.⁵⁵ In 2001, the United States Supreme Court decided the *J.E.M.* case and held that “newly developed plant breeds fall within the terms of section 101, and that neither the PPA nor the PVPA limits the scope of section 101’s coverage.”⁵⁶

After presenting the essential facts of the *J.E.M.* case, this section will consider the holding, some issues raised in the case, the Court’s analysis, and some implications of the holding.

A. *The Facts of the J.E.M. Case*

Although the *J.E.M.* case involved two private businesses, the holding has implications for universities that engage in plant genetic research. The primary facts from the case are as follows: Pioneer is a major player in the United States seed corn market, holding about forty percent of the annual \$5 billion market.⁵⁷ *J.E.M.* is an agricultural supply company.

Pioneer held seventeen utility patents protecting its inbred and hybrid corn seed products.⁵⁸ *J.E.M.* purchased from Pioneer hybrid corn patented by Pioneer. Pioneer sold its corn under a limited license agreement, which prohibited the licensee from reselling the corn. *J.E.M.* resold the licensed seed and Pioneer sued for patent infringement.

The particular seed that was resold by *J.E.M.* was protected by both a utility patent and a PVP certificate. Pioneer,

53. *Id.* at 305.

54. *Id.* at 313 (“[T]he relevant distinction was not between living and inanimate things, but between products of nature, whether living or not, and human-made inventions.”).

55. *See J.E.M.*, 534 U.S. at 127.

56. *J.E.M.*, 534 U.S. at 145.

57. Mike Godwin & Victoria Slind-Flor, “Patent Plums,” *The Year in IP, Almanac 2001*, IP Worldwide 66, 70 (Oct. 2001) (according to Victoria Slind-Flor, “[p]atent owner Pioneer Hi-Bred International, Inc., a subsidiary of E.I. du Pont de Nemours and Company, maintains about a 40 percent share of the \$5 billion annual market for seed corn in the United States.”).

58. *J.E.M.*, 534 U.S. at 127.

however, only sued for infringement of the utility patent, presumably because J.E.M. did not violate Pioneer's rights under the PVPA.⁵⁹

J.E.M. counterclaimed, arguing that Pioneer's utility patent was invalid because the PPA and PVPA were the "exclusive statutory means for the protection of plant life because these statutes are more specific than section 101, and thus each carves out subject matter from section 101 for special treatment."⁶⁰

B. The Holding of the J.E.M. Case

The Court held that Congress did not intend to remove plants from section 101 coverage and that "neither the PPA nor the PVPA limits the scope of § 101's coverage."⁶¹ Rather, Congress provided different statutory "products"—each with its own requirements and level of protection.⁶² The utility patent provides great protection while the PVPA provides less due to exemptions for saving seed and research. Thus, inventors or breeders may choose which "product," or patent, they want to "purchase." This scheme may be comparable to how State Departments of Motor Vehicles offer regular drivers' licenses as well as commercial drivers' licenses. Each licensing scheme entails certain rules, responsibilities, and privileges.

C. Issues Raised in the J.E.M. Case

Three primary issues were addressed in the *J.E.M.* case: (1) congressional intent, (2) impermissible statutory overlap, and

59. S. Ct. Oral Argument at 18, *J.E.M.* (No. 99-1996) (Oct. 3, 2001) (available at 2001 WL 1196195) (referring to 7 U.S.C. § 2541(d), J.E.M. claimed that J.E.M. "didn't do anything to infringe" on Pioneer's PVPA rights. 7 U.S.C. § 2541(d) says that [Pioneer's] rights are not infringed by the "perform[ance of] any act concerning [seed] . . . of a protected variety [i.e., Pioneer's protected corn] that is sold or otherwise marketed with the consent of the owner in the United States, unless the act involves further propagation of the variety. . . .").

There is some ambiguity as to whether the word "sold" refers (1) only to Pioneer's initial sale to J.E.M. or (2) to *any* sale of the protected seed. If situation (1) is correct, then J.E.M. did nothing wrong because its buyer apparently did not further propagate the variety. If interpretation (2) is correct, then it is immaterial that J.E.M.'s customer did not further propagate the protected variety because J.E.M. sold the seed *without* Pioneer's consent.

60. *J.E.M.*, 534 U.S. at 129.

61. *Id.* at 145.

62. *Id.* at 142 ("[T]here is a parallel relationship between the obligations and the level of protection under each statute.").

(3) the need for broad interpretation of patent laws. A few of the Court's ancillary concerns are also noted below.

1. Congressional Intent

The outcome of the *J.E.M.* case largely depended on the Court's interpretation of Congress's intent. *J.E.M.* argued that Congress does not pass legislation to be redundant. "If the patent laws before 1930 [i.e., the utility patent statute] allowed patents on 'plants' then there would have been no reason for Congress to have passed the 1930 PPA and to have limited the scope of plant patent protection to plants reproduced by asexual methods."⁶³ *J.E.M.* presented hard evidence (documentation) of Congress's intent in passing the PVPA. *J.E.M.* submitted page one of a House Report, which states the following under the "Purpose" heading:

Under patent law, protection is presently limited to those varieties of plants which reproduce asexually, that is, by such methods as grafting or budding. No protection is available to those varieties of plants which reproduce sexually, that is, generally by seeds. Thus, patent protection is not available with respect to new varieties of most of the economically important agricultural crops, such as cotton or soybeans.⁶⁴

This appears to be pretty clear evidence that Congress did not intend for the utility patent to cover sexually-reproduced plants.

J.E.M. argued that, in passing the PPA, the 1930 Congress intended "to expand the definitional limits of [the utility patent statute]."⁶⁵ Further, the 1930 Congress interpreted the utility patent statute as *not* including plants. Thus, it was error for the USPTO to ever issue a utility patent for a plant, and Pioneer's patent was thus invalid.⁶⁶ Countering *J.E.M.*'s

63. Br. of Pet. at 19, *J.E.M.*, 534 U.S. 124 (2001) (available at 2001 WL 499137).

64. *Id.* at 40 (citing H.R. Rpt. 91-1605, at 6 (Oct. 13, 1970)).

65. S. Ct. Oral Argument at 10-11, *J.E.M.* (No. 99-1996) (Oct. 3, 2001) (available at 2001 WL 1196195); see Act of Feb. 21, 1793, § 1, 1 Stat. 319 (Jefferson authored the Patent Act of 1793 in which he defined section 101 subject matter as "any new and useful art, machine, manufacture, or composition of matter, or any new or useful improvement [thereof]") (quoted in *Chakrabarty*, 447 U.S. at 308).

66. Br. of Pet. at 10, *J.E.M.*, 534 U.S. 124 (2001) (available at 2001 WL 499137).

Utility patents that are issued to provide federal protection of sexually reproducing corn plant varieties and their seeds are invalid. Seeds, seed grown plants and the parts thereof are not included within the ambit of the

argument, one Justice responded that the PPA did not constitute “an *explicit* prohibition” against protecting plants with a general utility statute.⁶⁷ The Court concluded that since Congress did not *explicitly* state that plants were excluded from section 101 coverage, utility patent coverage was available for plants.

2. Impermissible Statutory Overlap

Besides arguing Congressional intent, J.E.M. raised the issue of conflicting statutes. J.E.M. claimed that numerous statutory provisions conflicted with those of the utility patent.⁶⁸ For example, the PVPA exempts research and saving seed, whereas such uses are prohibited under the utility patent statute.⁶⁹ J.E.M. argued that “[t]he issuance of PVP certificates and utility patents on sexually reproducing plant varieties . . . would result in impermissible dual federal protection and direct conflicts in the scope of the federal protection granted on the same attribute—the ability to sexually reproduce the plant variety.”⁷⁰

As an amicus, the United States noted that the Department of Agriculture, at the time of argument, had issued a total of approximately 5,000 PVP certificates while the USPTO had only issued about 1,800 utility patents for plants.⁷¹ The Government “s[aw] no incompatibility between the two systems of protection.”⁷² The Court rebuffed J.E.M.’s argument and found that the different provisions of the two laws “do not present irreconcilable conflicts because the requirements for obtaining a utility patent under § 101 are more stringent than those for obtaining a PVP certificate, and the protections

utility patent subject matter Rather, federal protection of the corn seed products at issue in this case is exclusively obtainable under the provisions of the Plant Variety Protection Act. . . .

67. *Id.* at 11 (*italics added*) (at issue is the old legislative intent problem about whether we assume the answer is “no” unless Congress specifically says “yes” or whether we say “yes” unless Congress has explicitly indicated “no”).

68. *Id.* at 22–24.

69. *Id.* at 22.

70. *Id.* at 10.

71. S. Ct. Oral Argument at 41, *J.E.M.* (No. 99-1996) (Oct. 3, 2001) (available at 2001 WL 1196195).

72. *Id.* at 41–42.

afforded by a utility patent are greater than those afforded by a PVP certificate.”⁷³

Interestingly, as Pioneer began oral argument, Justice Kennedy foreshadowed a possible concern of the Court. Justice Kennedy stated that

in many statutes, if A, B, and C are covered [by section 101] and C [i.e., plant matter] is then removed [and placed in section 161], we make the inference that C is not intended to be covered any longer [by section 101]. But in this case, the under the sun language shows that they are such expansive terms in [section] 101, that perhaps we don't apply that usual rule and that [Pioneer] would prevail because of the terms being so general and so universal in . . . their coverage.⁷⁴

The Court took the view that the 1952 Congress stated the anything-under-the-sun⁷⁵ doctrine with the specific intent to preserve section 101's broad application. Congress basically said, “Yes, we are moving the PPA provisions to a separate chapter, but the utility patent statute still applies to anything under the sun, including new plant varieties.”

Besides employing the anything-under-the-sun doctrine, the majority used another canon of statutory construction to justify its holding. This canon states that repeal by implication is appropriate only “when the earlier and later statutes are irreconcilable.”⁷⁶ As mentioned before, the Court found no irreconcilable conflicts because the utility patent statute, the PPA, and the PVPA have different requirements and provide different levels of protection.⁷⁷ The Court therefore held that Congress did not intend to remove plants from section 101 coverage and that “neither the PPA nor the PVPA limits the scope of § 101's coverage.”⁷⁸

73. *J.E.M.*, 534 U.S. at 142.

74. S. Ct. Oral Argument at 24, *J.E.M.* (No. 99-1996) (Oct. 3, 2001) (available at 2001 WL 1196195).

75. Sen. Rep. 82-1979, at 5 (1952); H.R. Rpt. 82-1923, at 6 (1952).

76. *J.E.M.*, 534 U.S. at 141-142 (citing *Morton v. Mancari*, 417 U.S. 535, 550 (1974)).

77. *Id.* at 142.

78. *Id.* at 145.

3. Need for Broad Interpretation of the Utility Patent Statute

Another important issue in the *J.E.M.* case was the need for the Court to give a broad reading to the utility patent statute. Pioneer argued that section 101 has always been interpreted broadly because we never know what scientific developments tomorrow will bring. The terms of section 101 “need to be general because the patent law needs to fit ever-changing circumstances [and] because...we are not in a position to foresee what tomorrow’s inventions will be.”⁷⁹ Further, Pioneer noted that the “utility patent protection is so critically important to people in [the seed] industry is because... seeds are so easily copied by self-replicating.”⁸⁰ The Court purposefully gave section 101 a broad reading because “[a] rule that unanticipated inventions are without protection would conflict with the core concept of the patent law that anticipation undermines patentability.”⁸¹

At least one Justice expressed concern regarding the research exemption during oral argument, referring to the PVPA’s research exemption as “a very important special exemption.”⁸² In response, the United States explained that section 101 did not have a research exemption for a reason. “When greater research and development, greater disclosure, and higher standards for qualifying a patent have been met, there has been more of a contribution to public knowledge which, under our intellectual property laws, justifies a greater exclusive right for a limited period of time.”⁸³

On the other hand, *J.E.M.* noted some drawbacks with providing utility patent protection to plant materials. “[P]atents are being used to stop...the free use and transmission of genetic material.”⁸⁴ Recall that plant material

79. S. Ct. Oral Argument at 24, *J.E.M.* (No. 99-1996) (Oct. 3, 2001) (available at 2001 WL 1196195).

80. *Id.* at 35.

81. *Chakrabarty*, 447 U.S. at 316.

82. S. Ct. Oral Argument at 44, *J.E.M.* (No. 99-1996) (Oct. 3, 2001) (available at 2001 WL 1196195).

83. *Id.* at 44.

84. *Id.* at 22 (the PVPA’s coverage of essentially derived varieties affects both corporate and university breeders. Before the PVPA was enacted, breeders were free to share plant genes. By combining genes in different ways, breeders could improve crops. With the PVPA in force, protected varieties (containing genes that were previously shared freely) are tied up, hindering breeding progress. Suppose, for example, that Monsanto develops a superb gene that makes plants drought resistant,

patented under section 101 is not freely available for research. Because plant germplasm is being effectively “lock[ed] up” by [utility] patent protection, the agricultural industry has responded by consolidating.⁸⁵ Professor Jeff Maughan explained that

conglomeration has occurred because, in the middle of the biotech boom, large corporations realized it would be more profitable to own an entire revenue stream from development of genes to production of seed. Thus, Monsanto purchased seed companies like Dekalb and Asgrow, and DuPont purchased companies such as Pioneer Hi-Bred International. Not only did these acquisitions assure better revenues, but they also provided access to the best available germplasm and to established brand names, while protecting the acquirer’s outlet to the market.⁸⁶

Oddly, J.E.M. raised this argument even though it is not a research institution that is adversely affected by section 101’s lack of a research exemption.

D. Critique of the Court’s Analysis

The majority in *J.E.M.* focused on two facts: (1) Under *Chakrabarty*, the test is whether the invention is “human-made” or a “product of nature.”⁸⁷ (2) The PVPA does not “purport to provide the exclusive statutory means of protecting sexually reproduced plants.”⁸⁸

In his dissent, Justice Breyer pointed out that the Court’s reliance on *Chakrabarty* is improper. He noted that the question in *Chakrabarty* was whether § 101’s “language ‘manufacture, or composition of matter,’ [citation omitted] . . . included such living things as bacteria—a substance to which neither [the PPA nor the PVPA] refers.”⁸⁹ Justice Breyer raised a good point. The majority’s reliance on *Chakrabarty* would be more appropriate if Congress had been silent

and Pioneer develops a gene that makes the plants’ fruit very delicious. The individual varieties are PVP protected by the respective company. Unless some agreement is made, we will never enjoy a plant that includes both genes and both characteristics.).

85. *Id.*

86. Cahoon, *supra* n. 40.

87. *J.E.M.*, 534 U.S. at 134 (citing *Chakrabarty*, 447 U.S. at 313).

88. *Id.* at 138.

89. *J.E.M.*, 534 U.S. at 148 (2002) (Breyer, J. dissenting).

regarding IP protection for plants. Here, however, Congress provided explicit statutes covering plant varieties—the PPA and the PVPA. Thus, the question becomes, as Justice Kennedy hinted, whether plants should be excepted from § 101's anything-under-the-sun rule since the PPA and PVPA specifically provide IP protection for plant varieties.

However, even if plant *varieties* were properly excludable from section 101 protection, plant biotechnology has developed to the point at which protecting new *varieties* is only a small portion of patentable plant matter.⁹⁰ The weakness in this argument is that section 101 would still provide protection for “processes” and “compositions of [plant] matter” that do not fall under the PVPA's purview.⁹¹

Furthermore, the Court's holding perpetuated the USPTO's established practice of issuing utility patents for plant varieties. Justice Thomas noted that the USPTO has already issued “some 1,800 utility patents for plants, plant parts, and seeds.”⁹² In contrast, as of November 12, 2002, the USPTO had granted approximately 13,230 plant patents under section 161 (PPA).⁹³

Justice Ginsburg raised another point in favor of affirming the decision in favor of Pioneer. She suggested that it may be proper for the Court to pay some deference to the USPTO and the Federal Circuit Court of Appeals since those entities have more expertise in patent matters.⁹⁴

E. Implications of the Court's Holding

The *J.E.M.* holding will have a significant effect on seed manufacturers, farmers, and universities. Seed manufacturers may rest assured that first, they will be able to obtain utility patent coverage for the varieties they develop and second, that

90. Br. for Amicus Curiae Am. Intellectual Property Law Assn. in Support of Respt. Supporting Affirmance at 4, *J.E.M.*, 534 U.S. 124 (2001) (available at 2001 WL 649829).

91. 35 U.S.C. § 101 (2000).

92. *J.E.M.*, 534 U.S. at 127.

93. See e.g. plant patent number PP13,233, USPTO, *USPTO Patent Full-Text and Image Database*, <<http://patft.uspto.gov/netahtml/srchnum.htm>>.

94. S. Ct. Oral Argument at 8, *J.E.M.* (No. 99-1996) (Oct. 3, 2001) (available at 2001 WL 1196195) (question from Justice Ginsburg to *J.E.M.*: “As far as . . . the issue that is before us, we do have a position of the PTO and of the Federal circuit, both having more expertise than the rest of the Federal court we're on in these questions. Don't we owe those decision makers some deference?”).

they may force farmers to purchase new seed. As utility patent-protected seeds come to dominate the seed market, farmers will lose the legal ability to save seed for replanting the next season. Thus, farmers' seed costs will rise; however, the farmer will probably avoid some costs for pesticide, herbicide, or weather-related crop loss, depending on the type of GM seed used.

As the biotech revolution rolls on, small-scale farmers will come into more frequent contact with patent issues. "Most all of the new seeds being developed, whether genetically modified or convention[al], are being patented."⁹⁵ This can be an especially controversial issue since some seed developers are allowed to patent the seeds they develop with government funding (tax monies).⁹⁶

Universities engaged in plant genetic research will also be affected by the *J.E.M.* holding. Because the Court upheld the applicability of section 101 to plants, the university can require remuneration if someone uses the university's patented germplasm even for research. Recall that researchers are not required to give remuneration if the plant variety they are using is merely protected by a PVP certificate. Under the PVP Act, the university can only prevent unlicensed persons from *selling* the protected variety or "using it in producing (as distinguished from developing) a hybrid or different variety. . . ."⁹⁷

It is very difficult to accurately quantify the financial effects universities would feel if they were limited to PVP or PPA protection. From a financial standpoint, allowing the section 101 to cover plants is good for universities because it allows them to obtain stronger protection of valuable discoveries and thus receive greater remuneration via licensing

95. Marilyn Bay Wentz, *Whose Seed is it Anyway?*, Rocky Mtn. Farmers Union, <<http://www.rmfu.org/News/Stories/ShowFeature.cfm?ID=81>> (accessed Dec. 5, 2002) (Ms. Wentz quotes Dave Dechant, an alfalfa, wheat, corn and barley producer from Ft. Lupton, Colorado: "The rights granted by patents are broad and give patent owners market rights, which mean[s] [that] future seed contracts could obligate the grower to market his product through specific channels. . . . Such agreements would have serious, long-term negative consequences for America's independent family farmers and ranchers.").

96. *Id.* ("Purdue University's recent development of nematode resistant soybeans incorporated public funding and producer checkoff dollars. Private company Access Plant Technology, Inc., now has an exclusive license to the soybean seed patent.").

97. 7 U.S.C. § 2483(a)(1) (2000).

revenues. Accordingly, universities have more bargaining power now that plants are clearly patentable subject matter under the utility patent statute.

However, the days of easy-come, easy-go research are waning. Greater use of IP protection for plants makes it more difficult and expensive for the research community to build on the discoveries of universities that hold utility patents. Information sharing is hindered because researchers are less likely to reveal their findings until they know whether or not their findings are patentable. Also, utility patent protection for plants makes research more expensive because, without a research exemption, one university cannot freely use plant material that has been patented by another university. Of course, the utility patent holder can simply enter an agreement to allow other universities to use the protected plant for research purposes, but creating such a legal arrangement entails its own costs. To be fair, such an agreement could include a license provision requiring the university to forfeit or share revenue derived from discoveries that stem from use of the protected plant material.

III. UNIVERSITIES' USE OF IP LAWS TO PROTECT THEIR PLANT GENETIC RESEARCH

IP protection is important to universities that engage in plant genetic research. This section will discuss (1) how universities have been a major player in plant genetic research; (2) universities' and corporations' use of intellectual property to protect their plant genetic research; (3) collaboration between universities and private corporations; (4) collaboration between the federal government and universities; (5) the influence of the Bayh-Dole Act; (6) universities' interaction with foreign entities; and (7) trends involving plant IP.

A. Universities' Historical Role in Plant Genetic Research

Universities have played a major role in plant genetic research. One professor noted, "Transgenic plants currently in production [such as corn, soybean, and canola] were developed by corporate scientists. Nonetheless, the *basic* discoveries . . ., without which plant biotechnology would be impossible, were

mostly made in university laboratories.”⁹⁸ Some specific examples are notable. In 1976, Dr. Mary-Dell Chilton led a group of researchers at the University of Washington in discovering that “a bacterial cell could transfer some DNA to a plant cell.”⁹⁹ While studying as a graduate student at Washington State University, Ray Sheehy helped develop the FlavrSavr[®] tomato plant, the first transgenic plant commercialized in the United States.¹⁰⁰ In 1983, Washington University, St. Louis, joined the University of Ghent and Monsanto Corporation in DNA uptake experiments involving gene transfer. Today, *Agrobacterium*-mediated gene transfer is a widely-applied technique used “to achieve the transfer of DNA to plants.”¹⁰¹ Further, Roger Beachy of Washington University, St. Louis, is a pioneer in the production of virus-resistant plants,¹⁰² and Steven Tanksley and his lab at Cornell University have contributed to the discovery and cloning of pathogen-resistance genes.¹⁰³

B. Universities' and Corporations' Different Approaches to Plant-Related Intellectual Property

Universities and private corporations approach patents differently. This section will discuss how universities and private corporations differ in (1) their reliance on patenting and licensing revenue; (2) the research projects they choose to pursue; (3) the emphasis they place on publishing findings versus maintaining confidentiality; (4) their incentive to recoup investment; and (5) their use of plant patents and PVP certificates.

1. Patents and Licenses as New Sources of Revenue

While corporations have long recognized the value of patents and licenses, universities are still discovering these new revenue streams. As the IP trend continues, professors will likely feel more incentive to become IP-savvy as their universities turn toward patents to protect their inventions, to

98. Paul F. Lurquin, *High Tech Harvest* 116 (Westview Press 2002).

99. *Id.* at 79.

100. *Id.* at 190, ch. 5, n. 1.

101. *Id.* at 93.

102. *Id.* at 106.

103. *Id.* at 108.

maintain their freedom to operate, and to generate a revenue stream.¹⁰⁴ The university system is simple. Universities patent their inventions and then publish their findings; thereafter, corporations read about the new technology and seek a license from the university. Licensing often leads to profit sharing agreements between the researcher-inventor and the university.¹⁰⁵ For universities, a new revenue stream means more funding, improved programs and facilities, and ultimately better education for students.¹⁰⁶

Further, university professors are generally not paid exorbitant salaries, so a new revenue source—i.e., from patents and licensing—may be very attractive.¹⁰⁷ However, licensing revenue is not a university's nor a professor's sole interest. Receiving a royalty from a plant patent or license is "icing on the cake" so to speak.¹⁰⁸ Most universities still focus on doing good research; but if money from patents or licenses is available, universities will pursue it.¹⁰⁹

2. *Subjects of Research—Which Project to Pursue?*

Universities and corporations differ in the research projects they choose to pursue. University professors are more likely to look at long-term research even though it might have very little

104. Cahoon, *supra* n. 40.

105. *Id.*; see Boyce Thompson Inst., BTI Pat. Policy, <http://bti.cornell.edu/bti2/bti2_page.taf?page=patent_policy> (accessed Nov. 16, 2002) (Cornell's Boyce Thompson Institute, a plant research facility, maintains a patent policy that seeks to "assure that creative works at the institute are encouraged and rewarded while providing for the public good. Often this can best be achieved by patent protection of inventions in order to encourage industrial commercialization of research results, while benefiting BTI and the individual inventors.").

106. Cahoon, *supra* n. 40; see Eyal Press & Jennifer Washburn, *The Kept University*, The Atlantic Online <<http://www.theatlantic.com/cgi-bin/o/issues/2000/03/press.htm>> (accessed Dec. 14, 2002) (Gordon Rausser, who negotiated a deal between University of California, Berkeley and Novartis, argues in support of university-corporation partnerships. A Berkeley alumni magazine quotes Rausser as saying, "Without modern laboratory facilities and access to commercially developed proprietary databases . . . we can neither provide first-rate graduate education nor perform the fundamental research that is part of the University's mission.") (original article printed in *The Atlantic Monthly* (Boston) (Mar. 2000)).

107. Cahoon, *supra* n. 40.

108. *Id.*

109. *Id.*; see Blumenstyk, *supra* n. 1 (Dr. Donald Young and the University of Rochester are engaged in "the highest-ante patent battle ever undertaken by a university." They are "seeking billions of dollars in royalties from the companies that make and market Celebrex, an enormously successful arthritis drug.").

economic value. On the other hand, corporations are more likely to do a cost-benefit analysis to estimate the profitability of a potential research project.¹¹⁰ Also, some large corporations are becoming specialists in *applied* plant genetic research, seeking to incorporate university discoveries into marketable products.¹¹¹

Universities and private corporations may have different motives for researching the negative aspects of their experiments in plant genetics. One view is that corporations do not have as much incentive to research possible negative effects of their biotech products because they focus on profitability rather than environmental or health concerns.¹¹² One concerned individual noted that corporations tend to

limit the scope of research that they fund, and are unlikely to support research intended to produce findings that extend general scientific knowledge. They often are unwilling to fund the extensive exploration that may be necessary to explore all of the possible negative and harmful effects that may result from use of the products of such research.¹¹³

However, another view is that corporations monitor their biotech products because profitability is undermined if the genetically-altered gene breaks down and harms the environment or human health. Thus, corporations do have a motive to research the negative effects of their products (e.g., genetically-modified seeds).¹¹⁴

On the other hand, universities are less concerned with profitability because they have other sources of revenue such as state budget appropriations. Universities are also more likely to conduct research that will benefit the general public.¹¹⁵

110. Cahoon, *supra* n. 40.

111. *Id.*

112. E-mail from Michael Marsh, Bd. Member at Large, C. Puget Sound Ch., Wash. Native Plant Socy., to Timothy P. Daniels (Nov. 10, 2002) (copy on file with Mr. Daniels).

113. *Id.*

114. Cahoon, *supra* n. 40.

115. Marsh, *supra* n. 112 ("A research university with funding from a public agency would be much more likely to support research by faculty members in areas that may produce discoveries which will either extend and enlarge our general scientific knowledge, or will be immediately (and obviously) beneficial to members of the general public. There will also, very likely, be more collateral research to explore

3. *Publishing Findings and Maintaining Confidentiality*

Universities are generally more concerned with publishing their findings, while corporations are generally more concerned with maintaining confidentiality until their discovery is patented.¹¹⁶ This is an important difference because patentability is undermined if “the invention was patented or described in a printed publication in this or a foreign country . . . more than one year prior to the date of the application for patent in the United States.”¹¹⁷ In collaborating with universities, corporations are reasonably concerned that the university may prematurely release the corporately-funded invention into the public domain. Such release undermines patentability and the corporation’s potential revenue stream.¹¹⁸

4. *Recouping Their Investment*

Unlike universities, corporations require patents as a means to recoup their investment.¹¹⁹ While other sources of

possible negative consequences of use of such discoveries. Such collateral research is required by law in certain fields of investigation (for example, before drugs for human use are released by the Food and Drug Administration), but are not uniformly required in agriculture (despite limited jurisdiction by the Environmental Protection Agency) or many other fields.”).

116. E-mail from Stephen Smith, Pioneer Hi-Bred International, Inc. to Timothy P. Daniels (Nov. 25, 2002) (copy on file with Mr. Daniels) (e-mail includes language from John Grace, Germplasm Licensing Coord., Pioneer Hi-Bred International, Inc.) (In negotiating with corporations, “Universities almost always require the right to continue to use their invention, and often want the right to publish their results and sometimes [the corporation’s] own [results]. Generally we [the corporation] can get around this [i.e., can forestall publication and thus preserve patentability] with a review period for evaluating an invention for patentability. Some amount of confidentiality is required for us [corporations].”). See E-mail from Daniel Fairbanks, Professor, Dept. of Plant & Animal Sci., B.Y.U., to Timothy P. Daniels (Nov. 20, 2002) (copy on file with Mr. Daniels) (Prof. Daniel Fairbanks noted, “Since publication is the expected outcome of any research at a university, defensive publishing is a much better way to protect our work. There is little to no commercial potential for most of the products we produce, so the only reason to patent them is to prevent others from patenting them. Since defensive publishing is much less expensive and easier than patenting, it makes sense for us to use it.”).

117. 35 U.S.C. § 102(b) (2000).

118. Smith, *supra* n. 116 (e-mail language from John Grace in Smith e-mail).

119. *Id.* (language of Stephen Smith) (“The ability to obtain patents for inventions in plant breeding is critical to . . . maintaining research investments.”) See generally Stephen Smith, NIAB, BBP Satellite 1 *Colloquium Within the Generic Project Meeting: Molecular Tools for Biodiversity*, Vienna, December 1996 (published in *Molecular Screening News* No. 11) Plant Variety Identification & Registration (available at <<http://www.niab.com/bbp/vienna.htm>>) (accessed Dec. 2, 2002) (Dr. Smith noted, “If we suspect someone is using our material unlawfully, we send our lawyers out to see

revenue help immunize universities from investors' hesitations, private plant genetics research companies are vulnerable to market fluctuations.¹²⁰ Thus, if the Court had ruled against Pioneer Hi-Bred in the *J.E.M.* case (i.e., had held that plants cannot be protected by section 101 utility patents), universities would not have been as affected as plant biotech corporations. Plant biotech companies are very vocal whenever IP protection for plants is threatened,¹²¹ hence, in the *J.E.M.* case, corporations such as Monsanto, Cargill, BASF, and Delta Pine and Land Company submitted amicus briefs supporting Pioneer, even though Pioneer was a business competitor.

While universities have less need to recoup their investment, they do have an interest in the revenue and prestige that can accompany a valuable patent. For example, Columbia University's "royalty revenue for the 2000 fiscal year was more than \$143 million."¹²² University researchers still have financial incentive to conduct research because they receive a cut of the royalties.¹²³ Incidentally, from a brief

him or her. For example in 1980, we found what we thought was one of our inbreds in the background of another [competitor's] hybrid in the U.S. and we sued. Things progress[ed] very slowly in the U.S. courts but they finally ruled in 1994 that indeed that company had used our germplasm. . . . So in 1994 we received a cheque for [46.7] million dollars, so . . . there is real money involved here.") (\$46.7 million figure provided in e-mail from Stephen Smith, Pioneer Hi-Bred, Inc., to Timothy P. Daniels (Jan. 8, 2003)).

120. SeedQuest, News Releases, *Bionova R&D Operations at DNA Plant Technology Corporation to be Shut Down*, <<http://www.seedquest.com/News/releases/2002/may/4464.htm>> (accessed Nov. 16, 2002). ("The focus of DNAP's [DNA Plant Technology Corporation] research has been the production of transgenic plants which provide improved disease resistance for fruit and vegetable crops. Concerns about public acceptance of transgenic products in these markets have made producers reluctant to invest in the development of transgenic fruits and vegetables. Further, the agricultural industry has been suffering with reduced prices in the past few years, leading growers, food companies and other providers to delay new R&D investment. Despite an intensive search, these factors have made it difficult for the company to develop new customers. With this absence of a customer base, DNAP has not been able to obtain venture capital or other financing sufficient to continue R&D operations.")

121. Smith, *supra* n. 116 (language of John Grace) (if utility patent coverage of plants were threatened, "[u]niversities might not scream to the same extent we [corporations] would, because while their licensing is important to both revenue generation and also to maximum consumer benefit, the revenue stream is not their life blood (as it is ours).").

122. Goldie Blumenstyk, *Knowledge is 'a Form of Venture Capital' for a Top Columbia Administrator*, Chron. of Higher Educ. A24 (Feb. 9, 2001).

123. "In general, BTI will reward researchers for generating Patents by distributing 30% of net revenues from licensing arrangements to Inventors. . . . The remaining 70% of net revenues shall be utilized by BTI." Boyce Thompson Inst., *supra* n. 105.

review of the USPTO database, it appears that individual inventors, professors and researchers receive the patent, but they list the university's research foundation as the assignee.¹²⁴

Bio-ag companies have invested years' of research in developing genetically modified crops that can resist herbicides, insects, and climate fluctuations. Patents, including PVP certificates, are virtually the only means of protecting a corporation's investment and making its efforts profitable. In a full-page advertisement in an agricultural journal, the Monsanto Corporation asked farmers to refrain from illegally replanting patented seed and thus protect the economic incentive to invest in bio-ag research and development.¹²⁵

One might assume that universities have less to lose because they may receive federal grant funding; however, patents are still important to universities for a variety of reasons. Patenting a valuable discovery can bring prestige and significant revenue. Further, patenting is "seen as very favorable" and may have a positive effect on professors' compensation and eligibility for tenure or promotion.¹²⁶ Though not required for tenure, patenting is a "leveraging point."¹²⁷ Professors who patent their valuable research may be more likely to abandon ship and go work for a private company that can offer a better salary. If the university is going to retain such valuable, patenting professors, the

124. See e.g. patents 5,648, 599; 6,420,547; 6,395,964; and 6,268,552 at USPTO, *supra* n. 93.

125. Monsanto's advertisement read:

It takes millions of dollars and years of research to develop the biotech crops that deliver superior value to growers. And future investment in biotech research depends on companies' ability to share in the added value created by these crops. Consider what happens if growers save and replant patented seed. First, there is less incentive for all companies to invest in future technology, such as the development of seeds with traits that produce higher-yielding, higher-value and drought-tolerant crops . . . In short, these few growers who save and replant patented seed jeopardize the future availability of innovative biotechnology for all growers. And that's not fair to anyone.

See Martha L. Crouch, *How the Terminator Terminates*, *Synthesis/Regeneration* 18 (Winter 1999) (available at <<http://web.greens.org/s-r/18/18-16.html>>) (accessed Nov. 9, 2002).

126. Interview with Jeff Maughan, Assoc. Prof., Dept. of Plant & Animal Sci., B.Y.U. (Jan. 6, 2003).

127. *Id.*

university will probably need to increase their compensation or recognize the professor's value in some other way.

Because universities generally do not have a profit motive, they are less concerned with potential patent infringement when choosing among different lab techniques. Dr. Paul Lurquin implies this in his recent book, *High Tech Harvest*:

[T]oday there are two techniques very widely applied to achieve the transfer of DNA to plants: One is the *Agrobacterium*-mediated gene transfer and the other is biolistics [or "gene gun technology"]. Of the two, academic scientists much prefer the first one, owing to its predictability and versatility—it works well with numerous types of plants. Corporate scientists are more divided; for them, patents and potential patent infringements are as great a concern as the feasibility of the techniques themselves.¹²⁸

Royalties from utility patents can be substantial, although they do not provide the university with a predictable source of income since researchers usually do not know when they will make a valuable discovery. Furthermore, although some university researchers may not expect to license their inventions immediately, they may nonetheless obtain a patent because it "might be useful some day."¹²⁹

It is difficult to quantify the value that a breakthrough discovery can have to a university because a patent's value can be measured in various ways.¹³⁰ Methods of measuring value include the following: (1) licensing revenue for the university and the patenting professor, (2) positive publicity (which may help in recruiting top researchers and students), (3) increased likelihood that the university or its researchers may receive future federal funding for continued research, and (4) a good reputation among potential donors and industry.

128. Lurquin, *supra* n. 98, at 93.

129. E-mail from Adam Bogdanove, Asst. Prof., Dept. of Plant Pathology, Iowa St. U., to Timothy P. Daniels (Oct. 25, 2002) (copy on file with Mr. Daniels).

130. "How do you measure [the] value [of a patent]? By how much revenue the patent brings in? Or by how much it boosts a company's market value?" Godwin & Slind-Flor, *supra* n. 57. See *How Colleges Get More Bang (or Less) From Technology Transfer*, Chron. of Higher Educ. (July 19, 2002) ("For the growing number of universities eager to commercialize the inventions of their professors and graduate students, success—and failure—is measured in many ways. Money is only the most obvious one.").

5. Universities' and Corporations' Use of Plant Patents and PVP Certificates

Despite the important role that university researchers continue to play in the development of plant genetic technologies, private corporations hold the overwhelming majority of the plant patents and PVP certificates. Data from the USPTO provided the following information: From 1977 to 2001, Yoder Brothers, a corporation, received 599 plant patents from the USPTO.¹³¹ Yoder was the top plant patentee during this period. The second and third places were also held by corporations: Bear Creek Gardens, Inc. received 263 plant patents, and Conard-Pyle Company received 216 patents.¹³²

In first place among universities was the Regents of University of California, ranked thirteenth overall, receiving eighty-two plant patents. Holding the second place among universities was Rutgers University (thirty-eighth on list), which received only thirty-four plant patents. Obviously, universities have received (and have probably applied for) far fewer plant patents than private corporations.

This phenomenon may be partly due to the fact that university researchers are less concerned with patents than corporate researchers or that they may not be as knowledgeable about the provisions of IP law.¹³³ Being more IP-savvy, corporations succeeded in patenting plants and processes that were primarily developed in university laboratories.¹³⁴

131. USPTO, Information Products Division/TAF Branch, *Plant Patents: January 1, 1977–December 31, 2001*, <<http://www.uspto.gov/web/offices/ac/ido/oeip/taf/plant.pdf>> (accessed Nov. 25, 2002).

132. *Id.*

133. For example, Prof. Paul Lurquin noted that the Monsanto team “demonstrated great foresight” in 1983 when it—along with research teams from University of Ghent and Washington University, St. Louis—developed *Agrobacterium* mediated gene transfer while studying crown gall.

At that point [in 1983], no patents had been granted to anybody, simply because it was not yet an accepted norm (as it is today) for academic scientists to file patent applications for their discoveries. Monsanto’s participation in fundamental crown gall research would allow the company to claim precedence in the field of plant genetic engineering.

Lurquin, *supra* n. 98, at 82.

134. *Id.* (“Academic scientists have been remarkably incompetent at protecting their intellectual property. Although some have had foresight to protect their work, by and large, they never realized that their work would have the impact—good or bad—that it now has on society. The field was wide open for corporations to claim ownership

Although universities use plant patents, corporations are the primary users. A USPTO report provided the following data regarding the numbers of plant patents granted to universities from 1977 to 2001, inclusive, as well as the universities' overall rank among corporations, universities, and government agencies.¹³⁵

Rank Among Universities	University Name	Number Of Plant Patents Received	Overall Rank
1	Regents of University of California	82	13
2	Rutgers University	34	38
3	Cornell Research Foundation, Inc.	23	49
4	Purdue Research Foundation	22	52
5	University of Arkansas	12	95
6	Iowa State University Research Foundation, Inc.	11	103
7	Regents of University of Minnesota	11	108
8	Washington State University Research Foundation, Inc.	10	116
9	Colorado State University Research Foundation	8	126
10	University of Illinois	7	145
11	Board of Regents of University of Nebraska	6	163
12	Texas A&M University System	5	191
13	University of Connecticut	5	192
14	University of Florida Board of Regents	5	193
15	University of Tennessee Research Corporation	5	194

These top fifteen university entities obtained a total of only 246 plant patents during the noted twenty-five-year period.

of basic technologies that most of them hardly helped develop (except through financial support).").

135. USPTO, *supra* n. 131.

United States corporations (including the universities), the United States Government, and United States individuals obtained a total of 5,788 plant patents during the noted time period. Thus, the top fifteen universities (including research foundations and Boards of Regents) obtained only 4.3 percent of the plant patents granted.¹³⁶ Though not precise, the 4.3 percent figure is sufficiently accurate to tell us that universities received comparatively few plant patents.

It is clear that corporations, not universities, are the major players in patenting plants. The USPTO plant patent report also indicates that United States corporations received 4,183 plant patents since 1977. Thus, out of all United States corporations, universities as a subset received only 246 of the 4,183 or 5.9 percent of all the plant patents.¹³⁷

The same pattern seems to hold true with PVP certificates. During FY 1971–2002, public sources (i.e., universities and agricultural experiment stations) submitted an average of thirteen percent of the PVP applications received each year by the PVP Office.¹³⁸ Browsing through the PVP Application/Certificate Status Database,¹³⁹ one notices that private corporations are the predominant applicants.¹⁴⁰ Although corporations dominate the PVP statistics, it appears that universities have a bit more use for the PVP than the PPA.

Let's not be misled, however. Just because corporations receive more plant patents and PVP certificates does not mean that these protections are not vital to universities. Without IP protection and the consequent licensing revenues, research

136. This statistic is not entirely accurate, however, because the USPTO report contains only "national and international organizations (i.e., corporations, universities, government agencies) that have received five or more U.S. plant patents since 1977." *Id.*

137. Again, this statistic only accounts for entities that received at least five plant patents during the noted time period.

138. E-mail from Janice M. Strachan, Senior Examiner, Plant Variety Protection Office, to Timothy P. Daniels (Nov. 21, 2002) (copy on file with Mr. Daniels). Ms. Strachan provided data in a table entitled *University-Applicants*.

139. Plant Variety Protection Office, PVP Application/Certificate Status Database, <<http://www.ars-grin.gov/cgi-bin/npgs/html/pvplist.pl>> (accessed Nov. 25, 2002).

140. The student author conducted a search of the PVP Applicant/Certificate Status Database, inserting "university" in the "Applicant or Owner Name" field. The search resulted in a list of approximately 300 PVP certificates granted to university entities. The 300 "hits" included about 100 PVP certificates issued for varieties of common wheat and about 70 certificates issued for varieties of soybean.

universities would have less financial ability to carry on their plant genetics research programs. They would have to find other funding sources or scale back their research.

In fact, university usage of patents is taking off. Even “community colleges are beginning to develop intellectual-property policies to ensure that they and their faculty members can capitalize financially on the research conducted on their campuses.”¹⁴¹ Universities that do not become IP-savvy may forego a potential revenue stream and may be more likely to infringe on others’ patents, thus becoming subject to lawsuits for patent infringement.

C. Collaboration Between Universities and Private Corporations

Universities and private agribusiness corporations often seek mutually-beneficial relationships through licensing and through research partnerships.¹⁴² Universities frequently discover or invent something that the corporations find useful and profitable. However, universities usually lack the means to prepare their invention for commercial production and marketing. Since “strong IP on its own is useless,” professors work with their technology transfer offices to license the valuable invention to a corporation that has the resources to incorporate the technology into publicly usable goods.¹⁴³

141. *How Colleges Get More Bang (or Less) From Technology Transfer*, *supra* n. 130 (This article includes the results of a study conducted by *The Chronicle*. *The Chronicle* “analyzed the most recent five years of annual data from the Association of University Technology Managers on universities’ efforts to commercialize technology, and developed indicators to compare institutions.”).

142. Smith, *supra* n. 116 (cited portion from John Grace though e-mail sent via Stephen Smith) (“We at Pioneer like to think we have very close, cordial and mutually beneficial relationships with a large number of universities, and in particular with universities with plant genetics research programs.”).

Further, Stephen Jones, an instructor of graduate courses at Washington State University, noted that “the University of Idaho, North Dakota State University, the University of Minnesota and Oregon State University have . . . agreements with Monsanto to produce herbicide resistant wheat.” TomPaine.common sense, *In (Seed) Bed Together*, <<http://tompaine.com/feature.cfm/ID/5116>> (accessed Dec. 30, 2002).

143. Smith, *supra* n. 119 (“Having strong IP on something on its own is useless—it has to be coupled with and incorporated into a product that people are willing to purchase if its going to have any impact. [Corporations such as] Pioneer can provide the genetic vehicles into which useful traits can be added that make the overall genetic package more valuable and a better investment for their customer to purchase. . . . [Corporations] also have a superb ability to ramp up seed production and to get products to the market place.”). See Goldie Blumenstyk, *U. of Michigan Finds Good*

Universities maintain technology transfer offices or research foundations that have the responsibility

to facilitate the transfer to industry of technology from [the university] and thereby to benefit the public good through the development and subsequent sale of commercial products. A secondary goal is to generate unrestricted funds to motivate inventors and to support research and education at [the university].¹⁴⁴

While partnerships between universities and corporations may be beneficial, they may also be controversial. Historically, universities have been considered institutions of research and education rather than business ventures with a profit motive. This traditional emphasis is being seriously questioned: “Commercially sponsored research is putting at risk the paramount value of higher education—disinterested inquiry. Even more alarming, . . . universities themselves are behaving more and more like for-profit companies”¹⁴⁵ by “forming for-profit companies to commercialize their professors’ research.”¹⁴⁶

A specific concern with seed companies striking deals with public land grant universities is that such partnerships constitute an “abandonment of science that addresses true needs in favor of solving only problems that have proprietary or profit-driven answers.”¹⁴⁷ Lastly, some have concerns that private corporations sometimes “buy out” the research interests of university professors or do not pay a fair price to license valuable university discoveries.¹⁴⁸

University-corporation partnerships also raise questions about the purpose of public universities.¹⁴⁹ Opponents of

Research Is Not Enough, Chron. of Higher Educ. A24 (July 19, 2002).

144. Mass. Inst. of Tech., Tech. Licensing Off., *MIT Reports to the President 2000–2001* <<http://web.mit.edu/communications/pres01/09.15.html>> (accessed Jan. 18, 2003). Since they “deriv[e] [their] support . . . largely from public sources,” state universities may be more inclined to “dedicate[] [their] activities and services to the promotion and support of public welfare.” Iowa St. U., Statement of Patent Policy, <<http://www.public.iastate.edu/~isurf/policy/patentpolicy.html>> (revised and improved Oct. 21, 1982).

145. Press & Washburn, *supra* n. 106.

146. Lori B. Andrews, *Money is Putting People at Risk in Biomedical Research*, Chron. of Higher Educ. B4 (Mar. 10, 2000).

147. Jones, *supra* n. 142.

148. Maughan, *supra* n. 126.

149. Peter Schmidt, *States Push Public Universities to Commercialize Research: Conflict-of-Interest Fears Take Back Seat to Economic Development*, Chron. of Higher Educ. A26 (Mar. 29, 2002) (Schmidt quotes Virginia A. Sharpe, director of the Integrity

university privatization (i.e., close business/funding relationships between universities and corporations) are concerned that university-corporate ties will result in loss of academic freedom, conflicts of interest, and the use of public funds for private gain. On the other hand, supporters of university-corporation partnerships and stronger technology transfer programs argue that such partnerships will result in local economic development and improved educational opportunities.¹⁵⁰ Further, the proponents argue that the partnerships are a financial necessity and are needed to attract talented researchers to campus.¹⁵¹

Occasionally, universities' and corporations' interests conflict, resulting in lawsuits for patent infringement.¹⁵² In addition, universities sometimes require indemnification when negotiating with corporations about corporate funding of university research.¹⁵³

Corporations are sometimes reluctant to work with universities for a variety of reasons. First, the corporation may not need the university; typically, large corporations have well-endowed laboratories that yield more reliable data. Further, large corporations are more likely to have specialized equipment such as robotics that can work around the clock, unlike a team of graduate students. The corporation may dislike having to enter lengthy negotiations with the university's technology transfer staff. However, if a university professor has a significant "head-start" on some commercially

in Science Project at the Center for Science in the Public Interest. "Obviously, we need to have a public debate about what our public universities are for.").

150. *Id.* Further, regarding the issue of using public funds for private gain, Joel Hardi noted:

The Kellogg Commission on the Future of State and Land-Grant Universities, a 24-member panel that was established in 1996, issued a report calling on governments and colleges to collaborate to broaden access to higher education and improve relations with their surrounding communities, to make the nation's public colleges 'the public's universities,' as Lincoln envisioned when he signed the Morrill Act in 1862.

Land-Grant Presidents Call for New 'Covenant' With State and U.S. Governments, Chron. of Higher Educ. A41 (Mar. 31, 2000).

151. Schmidt, *supra* n. 149.

152. See *supra* n. 1 (regarding patent infringement suit by University of Rochester against makers of Celebrex).

153. Smith, *supra* n. 116 (language of John Grace) ("Indemnification provisions tend to loom, depending upon who is performing what activity.").

valuable research, the corporation will be more likely to seek some partnership.¹⁵⁴

Consulting is a less formal way in which corporations and universities interact. It is common practice for university professors to moonlight as consultants to outside entities. “[M]ost universities encourage the [moonlighting or consulting] activity because they believe it helps to keep the faculty members fresh.”¹⁵⁵ However, such professor-corporation interaction can be problematic for universities that are trying to keep close tabs on the intellectual property developed on their campus, to which the universities have some rights to royalties.¹⁵⁶ Also, though professors are often viewed as being unbiased sources of expertise, professor-consultants are subject to the same pressures as other expert witnesses when called to testify on behalf of a company seeking to win a lawsuit.¹⁵⁷

Despite the above criticisms, there are some positive aspects to university-corporation partnerships. First, professors can use their corporate ties to help place students in coveted internships. Second, corporate guidance or sponsorship can help professors avoid investing in useless or inane research projects.¹⁵⁸

D. Federal Government-University Partnership: Government Grants to Universities

Universities often receive federal funding for their plant research programs, while corporations generally do not.¹⁵⁹ Due

154. Maughan, *supra* n. 126.

155. Blumenstyk, *supra* n. 1.

156. *Id.* (“When professors consult on projects that overlap with their university research, and they happen to invent something, it can be difficult to sort out who has the rights to the invention.” Blumenstyk suggests that universities should have “conflict-of-interest polices that clearly establish how intellectual property will be managed in consulting situations” (quoting M. Guven Yalcintas, Vice President for Technology Transfer for the Research Foundation of State University of New York)).

157. Maughan, *supra* n. 126.

158. *Id.*

159. See e.g. USDA, ARS National Agricultural Library, Plant Genome Data & Information Center, 1997 USDA-NRI Plant Genome Awards, <<http://www.nal.usda.gov/pgdic/pggrantinfo/1997/>> (accessed Jan. 2, 2003); USDA, Biotechnology Risk Assessment Research Grants Program, *Abstracts of Funded Research – Fiscal Year 2001*, <<http://www.reeusda.gov/crgam/biotechrisk/biot01nt.htm>> (accessed Jan. 2, 2003). However, “[USDA Plant Genome] Grant recipients can be State agricultural experiment stations, colleges and universities, . . . and even private organizations, corporations, or individuals.” John D. Copeland, Natl. Ctr. for Agric. L. Research & Info., U. of Ark., *USDA Grants Boost Plant Genome Research*,

to their mission, land grant universities have special ties to the federal government. Overall, however, private investment in agricultural research has increased in importance to plant breeders, while the ratio of investment by government has decreased.¹⁶⁰ One commentator noted that the growing percentage of biotech investment is primarily due to private corporations investing in their own private research. Though public funding may have “dried up” a bit due to economic doldrums, university researchers can still seek public funding through the USDA or National Institutes of Health.¹⁶¹

University researchers commonly receive research funding from the United States Department of Agriculture Agricultural Research Service (ARS).¹⁶² In addition, funding occasionally comes from other federal sources such as National Institutes of Health (NIH) and National Science Foundation (NSF).¹⁶³

<http://warp.nal.usda.gov/pgdic/Probe/v1n3_4/usdagrant.html> (accessed Jan. 2, 2003) (citing 7 U.S.C. § 450(i)(b)(1)).

160. Smith, *supra* n. 119 (NIAB) (“Financial resources for breeding come from three sources; public taxation, private investment and sale of commercial products. Fewer funds for plant breeding are coming from tax revenues. Since 1977, most agricultural research in the US has come from the private sector. In 1994, public expenditures on agricultural research, in the U.S., were approximately \$2.7 billion; private expenditures were approximately \$3.7 billion (Fuglie et al., 1996). Therefore, many further benefits that can accrue to farmers and consumers from improved productivity generated by plant breeding will not be forthcoming unless private investment into breeding can be sustained or further increased. Private investment does not occur without strong intellectual property protection (IPP).”). See Press & Washburn, *supra* n. 106 (“[T]he rate of growth in federal support has fallen steadily over the past twelve years, as the cost of doing research, particularly in the cutting-edge field[] of . . . molecular biology, has risen sharply. State spending has also declined. . . . Meanwhile, corporate giving is on the rise, growing from \$850 million in 1985 to \$4.25 billion less than a decade later—and increasingly the money comes with strings attached.”).

161. Maughan, *supra* n. 126.

162. See e.g. USDA (1997 USDA-NRI), *supra* n. 159; USDA (Biotech. Risk), *supra* n. 159.

163. See e.g. Henry Daniell, Daniell Lab <http://pegasus.cc.ucf.edu/~daniell/daniell_grants.html> (accessed Nov. 7, 2002). See Ron Southwick, *Maya Critics Prompt Halt of NIH Project*, Chron. of Higher Educ. A20 (Dec. 7, 2001) (“[T]he International Cooperative Biodiversity Groups [ICBG] program [is] a consortium of universities and federal agencies formed to study the environment and develop drug treatments using natural products. The program is administered by the Fogarty International Center, the NIH’s international arm.”). See Natl. Insts. of Health, Insts., Fogarty Intl. Ctr. (FIC), ICBG, <<http://www.nih.gov/fic/programs/icbg.html#Introduction>> (accessed Dec. 5, 2002).

Dr. Robert Fincher has found that “[m]ost university breeding programs rely on state or USDA funding . . . [and that] industry funding is very small. [Further,] Federal funding from sources other than USDA is limited.” Fincher, *supra* n. 38.

The federal government uses the patent system to aid progress and development.¹⁶⁴ In a general sense, government-funded projects focus on broad research that may benefit the general public, and during periods of economic growth, the government is more likely to fund basic research, not just applied research aimed to yield marketable applications of the research.¹⁶⁵ In contrast, corporation-funded projects focus on research likely to produce a marketable commodity.¹⁶⁶ Thus, corporations focus on high-revenue crops like soybeans and corn, not artichokes and lima beans.¹⁶⁷ However, public-private partnerships do occur. Although there have been “[s]everal positive interactions between academic researchers and industry,” “[i]ntellectual property rights issues remain a major hurdle in forging a public-private partnership.”¹⁶⁸

E. The Influence of the Bayh-Dole Act on Universities

Universities, private corporations and the federal government often develop technologies (such as plant genetic discoveries) that have useful and valuable applications in the other sectors. The research of one entity or group yields

164. 35 U.S.C. § 200 (2000) (“It is the policy and objective of the Congress to use the patent system to promote the utilization of inventions arising from federally supported research or development; . . . ; to promote collaboration between commercial concerns and nonprofit organizations, including universities; to ensure that inventions made by nonprofit organizations [which includes universities, as noted in § 201(i)] and small business firms are used in a manner to promote free competition and enterprise. . . ; to promote the commercialization and public availability of inventions made in the United States by United States industry and labor; to ensure that the Government obtains sufficient rights in federally supported inventions to meet the needs of the Government and protect the public against nonuse or unreasonable use of inventions; and to minimize the costs of administering policies in this area.”).

165. Maughan, *supra* n. 126.

166. For example, the wheat industry sponsors some research at Washington State University (WSU). Kim Kidwell, a WSU wheat researcher, “select[s] for genes that reduce risks of production (disease, insect resistance genes) which enhance environmental safety, and improved the marketability of the crop (milling and baking quality).” E-mail from Kim Kidwell, Prof. of Crop & Soil Sci., Wash. St. U., to Timothy P. Daniels (Nov. 27, 2002) (copy on file with Mr. Daniels).

167. Lurquin, *supra* n. 98, at 161. Note, however, that some corporations provide research grants to professors working on commercially inviable projects, i.e., improving the yield of a crop not widely consumed. Such grants are arguably provided as a public relations tool, a humanitarian effort, or both. Maughan, *supra* n. 126.

168. Natl. Science & Tech. Council, Comm. on Science, Working Group on Plant Genomes, National Plant Genome Initiative, Progress Report (Dec. 2001), <http://www.ostp.gov/nstc/html/mpgi2001/executive_summary.htm> (accessed Jan. 2, 2003).

benefits to the others.¹⁶⁹ In 1980, Congress passed the University and Small Business Patent Procedures Act (the Bayh-Dole Act) in part “to promote collaboration between commercial concerns and nonprofit organizations, including universities.”¹⁷⁰

The Bayh-Dole Act¹⁷¹ requires universities that receive federal grant funds to (1) disclose inventions discovered with federal funds to the federal agency that provided the funds; (2) elect whether to retain title in the invention discovered with federal funds; and (3) file for patent protection. If the recipient university (a.k.a. “nonprofit organization” or “contractor” in the Act) fails to do these three things within a reasonable time, the federal agency may take sole title to the invention that was developed with federal funds.¹⁷²

169. 15 U.S.C. § 3701. (current through P.L. No. 107-278 (excluding P.L. No. 107-250 to 252, 273)) (Section 1 of Executive Order No. 13185 (66 F.R. 701, Dec. 28, 2000) states, “The partnership in science and technology that has evolved between the Federal Government and American universities has yielded benefits that are vital to each.”).

170. 35 U.S.C. § 200 (2000) (“[T]o use the patent system to promote the utilization of inventions arising from federally supported research or development; . . . ; to promote collaboration between commercial concerns and nonprofit organizations, including universities; to ensure that inventions made by nonprofit organizations [including universities] . . . are used in a manner to promote free competition and enterprise; to promote the commercialization and public availability of inventions made in the United States by United States industry and labor; to ensure that the Government obtains sufficient rights in federally supported inventions to meet the needs of the Government and protect the public against nonuse or unreasonable use of inventions; . . .”) (italics added).

171. P.L. No. 96-517, 1980 H.R. 6933 (codified at 35 U.S.C. chapters 30 and 38).

172. 35 U.S.C. § 202 (P.L. No. 96-517, 1980 H.R. 6933). Blumenstyk summarizes the Act this way:

Under the 1980 Bayh-Dole Act, universities have the right to own and commercialize such inventions. But they are also required to inform agencies of all inventions. That is to preserve the government’s right to a royalty-free use of the invention, and its right to ‘march in’ and take control of an invention if it deems that the company selected to commercialize the invention is acting against the public interest.

Universities Try to Keep Inventions From Going ‘Out the Back Door’: To Keep Hold of Lucrative Licenses, Institutions Educate, Cajole, and Sometimes Sue, Chron. of Higher Educ. (May 17, 2002). See Press & Washburn, *supra* n. 106 (“The goal of the legislation was to bring ideas out of the ivory tower and into the marketplace, by offering universities the opportunity to license campus-based inventions to U.S. companies, earning royalties in return. Both the government and the business world saw universities not merely as centers of learning and basic research but as sources of commercially valuable ideas.”).

A report by the Department of Commerce summarized the Act:

The Bayh-Dole Act created a uniform Federal patent policy that permits most Federal laboratories to grant exclusive licenses on Federal patents to United States businesses and universities. Private firms had been reluctant to invest substantial time and resources in the commercialization of a Federally developed technology under a non-exclusive government license that competitors could secure as well. The Bayh-Dole Act eliminated this barrier to innovation.¹⁷³

The Bayh-Dole Act caused a great leap in the numbers of patent applications filed by universities.¹⁷⁴ "This legislation . . . enable[s] universities . . . to own and patent inventions developed under federally funded research programs. The act provides an incentive for universities to market their innovations and for industry to make high-risk investments."¹⁷⁵

The AUTM summarized the effects of the Bayh-Dole Act: "The rise of biotechnology R&D and, more generally, of research in the life sciences, since the early 1980s also boosted the number of research universities with offices of technology licensing, and increased the incomes earned by these offices."¹⁷⁶ Continuing, the AUTM noted,

During recent decades American research universities have become increasingly involved in various technology transfer activities by establishing technology business incubators, technology parks, venture capital funds for start-up companies, university research foundations, and technology licensing offices. This trend toward . . .

173. U.S. Dept. of Commerce, Tech. Admin., *Technology in the National Interest* 31 <<http://www.ta.doc.gov/Reports/TechNI/chp2e.htm>> (1996).

174. Purdue U., *Common Questions & Answers About Technology Transfer*, <<http://www.purdue.edu/UNS/hot.topics/970313.Tech.Transfer2.html>> (accessed Nov. 20, 2002) ("Prior to 1980, fewer than 250 patents were issued to U.S. universities each year and discoveries were often not commercialized for the public's benefit. Today, U.S. universities participating in a survey by the Association of University Technology Managers, Inc., (AUTM) are issued an average of almost 1,500 patents per year. Moreover, there are now more than 200 universities engaged in technology transfer, eight times more than in 1980, as evidenced by the membership of AUTM.")

175. *Id.*

176. Everett M. Rogers, Jing Yin, & Joern Hoffman, *Assessing the Effectiveness of Technology Transfer Offices at U.S. Research Universities*, XII J. of the Assoc. of U. Tech. Managers (2000), <<http://www.autm.net/pubs/journal/00/Copy%20of%20assessing.html>> (accessed Nov. 25, 2002) (internal citation omitted).

'academic capitalism' is also illustrated by an increase in the number of university-based research centers, and by the tendency for some universities to retain partial ownership in the start-up companies spinning out of university research.¹⁷⁷

The AUTM went on to explain why some universities find "academic capitalism" so desirable.

Through this variety of boundary-spanning activities, research universities seek to facilitate the transfer of technological innovations to private companies in order (1) to create jobs and to contribute to local economic development, and (2) to earn additional funding for university research. Technology transfer from research universities has been increasingly recognized as an engine for economic growth in the United States. This relatively new role for research universities has been greeted with considerable discussion and debate.¹⁷⁸

The Bayh-Dole Act was followed by other efforts to facilitate working relationships between the federal government and private entities. In 1986, Congress passed the Federal Technology Transfer Act (FTTA), which "authorized Federal agencies to enter into cooperative research and development agreements (CRADAs) with companies, universities, and non-profit institutions for the purpose of conducting research of benefit to both the Federal government and the CRADA partner."¹⁷⁹

Further, one commenter noted some of the changes resulting from legislation such as the Bayh-Dole Act and FTFTA:

Before [the 1980s], research conducted at universities and supported by public funds belonged to the public. But the new laws [e.g., Bayh-Dole, FTFTA, and others] give academic researchers intellectual-property rights; now they can, for example, patent a gene they discover or an invention they make, even if the entire enterprise has been financed by taxpayers through [federal grants].¹⁸⁰

177. *Id.* (internal citations omitted).

178. *Id.* (internal citations omitted).

179. U.S. Dept. of Commerce, *supra* n. 173, at 32.

180. Andrews, *supra* n. 146.

Another concern raised by passage of the Act is that it gives incentives to public universities to focus more on the same type of [research] activities that are being performed by the private sector thereby undermining [taxpayers'] ability to get basic and fundamental research done and into the public domain.¹⁸¹

F. Universities' Interaction With Foreign Entities

As the globalization trend continues, universities are having more interaction with foreign entities.¹⁸² Globalization presents both challenges, such as biopiracy, and opportunities, such as humanitarian projects in developing countries.

Biopiracy is a hot topic closely related to university plant genetic research. Some university researchers have run into resistance from foreign governments when they seek source material from abroad (i.e., foreign landraces). Occasionally, foreign governments are reluctant to allow United States researchers to genetically modify the foreign plant and obtain a U.S. patent.¹⁸³ University researchers involved in humanitarian-related plant research occasionally have difficulty obtaining plant germplasm from less-developed countries for use in their research. "This ironically hinders the ability of humanitarian-oriented crop research projects . . . to assist these nations in both characterizing and improving their native crop genetic resources."¹⁸⁴ There is great concern regarding biopiracy—United States corporations and universities profiting from germplasm provided by developing countries without giving any compensation to the source countries.¹⁸⁵ In contract terms, biopiracy may be considered *unjust enrichment*.

181. Smith, *supra* n. 119 (this e-mail solely from Stephen Smith).

182. See e.g. Outlook, *Syngenta Pulls Out of Research Collaboration with IGAU* (Indira Gandhi Agric. U.) <http://www.outlookindia.com/pti_news.asp?id=103244> (accessed Dec. 17, 2002).

183. Kultida Samabuddhi, *U.S. Work on Jasmine Rice Causes Worry*, Bangkok Post (India), <http://scoop.bangkokpost.co.th/bkkpost/2001/october2001/bp20011004/news/04oct2001_news11.html> (accessed Nov. 16, 2002). See Chris Wescott, *Thai Jasmine Rice and the Threat of the US Biotech Industry*, Me. Organic Farmers & Gardeners Assn. <<http://www.mofga.org/news20020119.html>> (Dec. 8, 2001).

184. E-mail from Eric N. Jellen, Assoc. Prof., Dept. of Plant & Animal Sci., B.Y.U., to Timothy P. Daniels (Oct. 14, 2002) (copy on file with Mr. Daniels).

185. See Southwick, *supra* n. 163.

Universities have a unique niche when it comes to plant genetic research that focuses on humanitarian or development applications. Frequently nonprofit organizations (NPOs) have contacts and grass-roots level personnel located in third-world countries. Universities often have expertise and research facilities that NPOs lack. Thus, universities seeking to establish humanitarian projects can benefit by partnering with NPOs already located in the target country.¹⁸⁶

Such partnerships are most valuable when they focus on small-scale crops like cassava, sweet potatoes, and quinoa, rather than major food crops like corn and soybeans on which large corporations focus.¹⁸⁷ Small-scale crops are not big money makers, yet they can be a vital source of nutrition to third-world peoples.

G. Possible Future Action by Congress

Congress will probably not amend the general utility patent to exclude plant patents. If the amicus briefs filed in support of Pioneer are any indication, the plant biotech industry would vigorously oppose such an amendment because of its significant investment.¹⁸⁸

Some people involved in the plant IP and research industry indicate that the USPTO may need to raise the bar regarding IP protection for plants.¹⁸⁹ The USPTO may be giving patent protection too liberally.¹⁹⁰ The Nuffield Council on Bioethics

186. Universities, however, are establishing more global contacts. Eugene B. Skolnikoff recently wrote about "the internationalization of higher education": "As competence in science and technology spreads throughout the world, and as more subjects must be dealt with on a global scale, all major research universities and many other higher-education institutions have established a wide variety of international ties." *Protecting University Research Amid National-Security Fears*, Chron. of Higher Educ. B10 (May 10, 2002).

187. Lurquin, *supra* n. 98, at 161 ("[C]rops such as cassava . . . , bananas, the sweet potato, and oil palm trees are receiving attention thanks to the establishment of consortia between developing countries' institutions and Western universities. This cooperation would not have occurred if biotech companies had been involved in only these applications, because the crops just described are considered to be small crops, not worth much investment in research and development.").

188. Smith, *supra* n. 116 (If utility patent coverage of plants were threatened, "Universities might not scream to the same extent we [corporations] would, because while their licensing is important to both revenue generation and also to maximum consumer benefit, the revenue stream is not their life blood (as it is ours).").

189. E-mail from Daniel Fairbanks, Prof., Dept. of Plant and Animal Sci., B.Y.U., to Timothy P. Daniels (Oct. 9, 2002) (copy on file with Mr. Daniels).

190. Nuffield Council on Bioethics, *Genetically Modified Crops: The Ethical and*

expressed concern over the issuance of overly broad patents in the following statement:

The intent of patent law is that the right to exploit should be set against the encouragement of further invention. Excessively broad claims could, because they can block the route to implementation, act contrary to this intent. . . . We take the view that excessively broad patents will diminish useful research and so diminish welfare.¹⁹¹

Consequently, the Nuffield Council on Bioethics “recommend[s] that national patent offices . . . draw up new guidelines . . . to discourage the over-generous granting of patents with broad claims that have become a feature of both plant and other areas of biotechnology.”¹⁹²

There is some indication, however, that the USPTO has started to implement some of the suggestions made by the Nuffield Council. The USPTO may be “becom[ing] more strict in its handling of applications, especially as regards broad claims.”¹⁹³ However, the effects of narrow versus broad claims continue to be hashed out in the courts. For example, the United States Supreme Court recently held that

[a] patentee who narrows a claim as a condition for obtaining a patent disavows his claim to the broader subject matter, whether the amendment was made to avoid the prior art or to comply with § 112. We must regard the patentee as having conceded an inability to claim the broader subject matter or at least as having abandoned his right to appeal a rejection. In either case estoppel may apply.¹⁹⁴

The law of intellectual property involving plants is in a state of flux and probably will be for years to come. In fact, this has been dubbed the “Biotech Century.”¹⁹⁵

Social Issues ch. 3 “Broad Claims,” <<http://www.nuffieldbioethics.org/publications/gmcrops/rep0000000112.asp>> (accessed Dec. 16, 2002).

191. *Id.*

192. *Id.*

193. E-mail from Janice M. Strachan, Sr. Examiner, Plant Variety Protection Off., to Timothy P. Daniels (Dec. 16, 2002) (copy on file with Mr. Daniels) (noting presentation by patent attorney Robert Jondle (Jondle & Associates, P.C.) at a recent conference of the American Seed Trade Association).

194. *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 122 S. Ct. 1831, 1840 (2002).

195. Sheila R. Arriola, *Biotechnology Patents After Festo: Rethinking the*

IV. CONCLUSION

There are three statutes under which an inventor may protect their plant genetic research—the general utility patent, the PPA, and the PVPA. The *J.E.M.* holding resolved an ambiguity in patent law—whether the PPA and PVPA preempted using the section 101 utility patent to protect plant varieties. To seed companies' delight, the Court affirmed inventors' rights to obtain section 101 protection for plant varieties. As section 101-protected seeds come to dominate the seed market, farmers will have no choice but to purchase patented seed each year, rather than saving seed for replanting. Besides affecting farmers, the *J.E.M.* case will affect—for both good and ill—universities that engage in plant genetic research.

The benefit of the *J.E.M.* decision is that universities will be able to more easily capture the full economic value of their plant genetic inventions and discoveries. The negative aspect of this case, however, is that professors and universities will be hesitant to publish their findings until they have obtained IP protection or until they believe the discovery is not worth marketing.

Encouraged by legislation such as the Bayh-Dole Act, universities have become more involved in IP issues since 1980; after all, what university would not like to supplement its revenue with royalties from license agreements? However, there are valid concerns with mission drift as publicly-supported universities become more entangled with corporate sponsors.

There are some important differences in the ways in which universities and corporations approach IP issues. Universities tend to be primarily interested in research for educational purposes involving the public good, while corporations, of course, generally have a profit motive.

Also at issue is the propriety of United States entities—corporations as well as universities—genetically altering and patenting foreign countries' indigenous plants without providing just compensation. Developments in plant biotechnology present universities with the problematic issue

Heightened Enablement and Written Description Requirements, 11 Fed. Cir. B. J. 919, 923 (2002) (citing Jeremy Rifkin, *The Biotech Century* xv (1998)).

of biopiracy and with the opportunity to provide significant humanitarian service.

The holding of the *J.E.M.* case may not have been as pivotal as that of *Chakrabarty* (namely, living things are patentable),¹⁹⁶ yet *J.E.M.* confirmed *Chakrabarty's* broad, anything-under-the-sun,¹⁹⁷ interpretation of patent rights provided by section 101. Universities that engage in plant research should be aware of the *J.E.M.* holding. They should find out whether their source plant materials are patented under section 101 because they may need to obtain permission to use that source material for research. If more and more plant materials receive utility patent protection, universities may incur new costs as their technology transfer staff will need to be aware of plant patent issues. However, some, if not all, of the costs may be offset by licensing revenues if the university obtains IP protection on its own plant inventions.

Timothy P. Daniels

196. See *supra* n. 51.

197. See *supra* n. 21. *Chakrabarty*, 447 U.S. at 309 (quoting Sen. Rep. 1979, 82d Cong., 2d Sess., 5 (1952); H.R. 1923, 82d Cong., 6 (1952) (statement made by P.J. Frederico, a principle draftsman of the 1952 Act, *Hearings on H.R. 3760 before Subcommittee No. 3 of the House Committee on the Judiciary*, 82d Cong., 1st Sess., 37 (1951) (quoting *Johnson v. Johnson*, 60 F. 618, 620 (W.D. Pa. 1894))).