FOCUS

Patents, Protections, and Privileges

The Establishment of Intellectual Property in Animals and Plants

By Daniel J. Kevles*

ABSTRACT

Utility patent protection has been granted broadly to living organisms in the United States only in the last quarter century, but in the late nineteenth century, for reasons related to the nationalization of agricultural markets, animal breeders and plant innovators began attempting to devise alternative arrangements to protect intellectual property (IP) in their living products. The arrangements had to take into account both the requirements of IP protection and the various ways the organisms could be reproduced. For animals, prior to patentability, the arrangements involved mainly breed associations and registries. Plant innovators tried to achieve returns from their IP through pricing strategies and trademarks. Finding neither adequate, they began to agitate for legislation that would protect their type of IP, an effort that resulted in the passage of the Plant Patent Act of 1930, the first legislation anywhere to extend a type of patent protection to living products.

IN JUNE 1980, in *Diamond v. Chakrabarty,* the United States Supreme Court held by a majority of five to four that so-called utility patent protection could be extended to a living microorganism. The microorganism in question was a type of *Pseudomonas,* a bacterium that Ananda Chakrabarty, a biochemist at the General Electric Company, had bioengineered to consume oil slicks by introducing into it plasmid DNA from foreign bacteria. The requirements for a utility patent, which is by far the most common type, include the stipulations that the invention must be man made and useful. The U.S. Patent Office had denied Chakrabarty's patent application on grounds that a utility patent could not be issued on a microorganism because it was a product of nature rather than of man and because it was living. The Court held, however, that whether an invention was alive was irrelevant

* Department of History, Yale University, New Haven, Connecticut 06520–8324.

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to its patentability, that the bacterium was a product not of nature but of Chakrabarty's ingenuity, and that it thus merited a patent under existing law.[1]

The section in the U.S. patent code on which the Court relied declared, in language written by Thomas Jefferson in the patent law of 1793, that patents could be obtained for "any new and useful . . . machine, manufacture, or composition of matter, or any new or useful improvement thereof."[2] What enabled the patenting of Chakrabarty's bacterium was the finding of molecular biology that genes are DNA, a chemical molecule. Chakrabarty's introduction of the foreign DNA into the *Pseudomonas* thus made the recipient bacterium a new, man-made composition of matter. After the *Chakrabarty* ruling, several critics noted that the decision appeared to leave no legal obstacle to the patenting of higher forms of life, including animals. They were right. In 1985 the U.S. Patent Office issued the first utility patent on a genetically engineered plant. In 1987 it held that genetically engineered animals other than human beings were patentable; and in 1988 it issued the world's first animal patent, on a mouse that had been genetically engineered at Harvard University to be supersusceptible to cancer.[3]

The U.S. patent system, which rests on Article I, Section 8, of the Constitution, reflects the nation's commitment to technological development in the context of a capitalist, free-market economy. It grants innovators the exclusive right to make, use, and sell their inventions for a limited number of years in exchange for their willingness to reveal the details of their creations. It aims to provide an incentive to invention and is grounded in the premise that innovators have a right to profit from their labors.[4] If the extension of utility patents to living organisms was enabled by advances in molecular genetics and technology, it was also promoted by advocates of the emerging biotechnology industry and its academic allies, both of whom frankly declared to the Court their manifest interest in the incentives and the profits that such extension would provide.[5] The recent history of intellectual property (IP) in living organisms is thus a branch of the history of molecular genetics and biomedicine, with connections to utility patent law and the commercialization of the university.

The biotechnologists of recent history, however, were not the first to be concerned with protecting intellectual property in living organisms. Through much of the nineteenth cen-

[1] *Diamond v. Chakrabarty,* 447 U.S. 303, 100 S.Ct. (1980), 2207. For the full story of the case see Daniel J. Kevles, "Ananda Chakrabarty Wins a Patent," *Historical Studies in the Physical and Biological Sciences,* 1994, *25*:111–136; and Rebecca S. Eisenberg, "The Story of *Diamond v. Chakrabarty*: Technological Change and the Subject Matter Boundaries of the Patent System," in *Intellectual Property Stories,* ed. J. C. Ginsburg and R. C. Dreyfuss (New York: Foundation, 2006), pp. 327–357.

[2] 35 U.S.C. §101; Bruce W. Bugbee, *Genesis of American Patent and Copyright Law* (Washington, D.C.: Public Affairs Press, 1967), p. 152; and Fritz Machlup, "Patents," *International Encyclopedia of the Social Sciences,* ed. David L. Sills (New York: Macmillan, 1968), Vol. 11, pp. 461–464.

[3] Glen Bugos and Daniel J. Kevles, "Plants as Intellectual Property: American Law, Policy, and Practice in World Context," *Osiris,* 2nd Ser., 1992, *7*:119–148; and Kevles, "Of Mice and Money: The Story of the World's First Animal Patent," *Daedalus,* Spring 2002, *131*:78–88.

[4] The monopoly part of the bargain is to provide incentive for the inventor, and the publication part is to promote further innovation by others. See the introductory overview of patent law in Arthur R. Miller and Michael H. Davis, *Intellectual Property: Patents, Trademarks, and Copyrights in a Nutshell,* 2nd ed. (St. Paul, Minn.: West, 1990), pp. 4–18.

[5] The briefs *amicus curiae* in the *Chakrabarty* case reveal these interests. See *Brief Amicus Curiae of the Regents of the University of California,* Jan. 1980; *Brief of Dr. Leroy Hood, Dr. Thomas Maniatis, Dr. David S. Eisenberg, the American Society of Biological Chemists, the Association of American Medical Colleges, the California Institute of Technology, the American Council on Education as Amicus Curiae,* 28 Jan. 1980; and *Brief on Behalf of Genentech, Inc., Amicus Curiae,* Jan. 1980. The *amicus* briefs are with *Diamond v. Chakrabarty,* U.S. Supreme Court, Docket No. 79–136, 447 U.S. 303, Jan. 1980.

tury, plant and animal improvers did not speak of "intellectual property"—the phrase was coined in a Massachusetts court case in 1845—but they were alive to the concept. They understood that utility patents were unavailable to them.[6] Plants and animals were not machines or manufactures. Improvements upon them were not then identifiable as new compositions of matter. And how could one define the utility of an ornamental plant—say, a rose exhibiting a new fragrance or hue? No less profit minded and imaginative than contemporary biotechnologists, these plant and animal improvers devised a variety of property-protection arrangements outside the patent system to achieve protection of the IP in their living innovations.

In establishing their arrangements, the improvers recognized, at least tacitly, that they had to deal with several difficulties. No property right is worth the paper it is written on if it cannot be enforced. The requirements for enforcement include the ability to specify and warrant the identity of the property. This was easily accomplished with a tract of land by surveying and recording the lengths and bearings of its boundaries. In contrast, specifying the identity of a living organism—for example, a Shorthorn bull or a Concord grape—was problematic, given that defining biological knowledge such as blood types and DNA sequences lay far in the future.

The establishment of *intellectual* property in an invention also calls for capability to reproduce the product with its valuable characters. Absent that ability, the IP would be worthless. Faithful reproduction of an organism depends on practical and/or theoretical knowledge of heredity. But the achievement of reproductive fidelity posed a problem for plant and animal improvers that the innovators of, say, mechanical reapers did not face. Unlike reapers, living organisms reproduce themselves. If an improved plant or animal reproduced itself faithfully—or could be made so to reproduce itself—the original improver potentially faced competition from the purchaser.

In the nineteenth century, identification of a living organism could take the form of a written description, a drawing, or a photograph, but such descriptions were by no means exact or adequate for the purposes of IP disputes. The ability to identify and reproduce a plant or animal depended on the improver's craft knowledge of biology, heredity, and breeding practices.[7] Adumbrating the later history, the history of IP in living organisms during the nineteenth century—and, indeed, even long after the rediscovery of Mendel's laws, in 1900—thus concerns the interplay among such craft knowledge on the one side and the arrangements that this body of knowledge and skills at any given time permitted.

In the United States, IP protection in law for living products found its way onto the agenda of plant and animal improvers during the latter third of the nineteenth century.

[6] The judge in the 1845 case, upholding the broad patent of an inventor of cotton-spinning machinery, declared: "Only . . . in this way can we protect intellectual property, the labors of the mind, productions and interests as much a man's own, and as much the fruit of his honest industry, as the wheat he cultivates, or the flocks he rears." Quoted in Catherine Fisk, "The History of Intellectual Property Comes of Age," Keynote Address, Wisconsin Legal History Symposium, University of Wisconsin Law School, 13 Nov. 2004, p. 6 (unpublished MS, copy in author's possession). In the nineteenth century only one utility patent was issued on a living organism in the United States—a type of yeast that Louis Pasteur claimed as an "article of manufacture"—but that was the exception that proved the rule. Pasteur's patent, no. 141,072, was issued in 1873. See Graham Dutfield, *Intellectual Property Rights and the Life Science Industries: A Twentieth-Century History* (London: Ashgate, 2003), p. 151.

[7] The *locus classicus* for information on the biological beliefs and practices of plant and animal breeders in the later nineteenth century is, of course, Charles Darwin, *Variation in Plants and Animals under Domestication,* 2 vols. (London: John Murray, 1868), available at *The Writings of Charles Darwin on the Web,* http://pages.britishlibrary.net/charles.darwin/texts/variation/variation_fm1.html (accessed 29 Jan. 2006).

Before then, markets in agricultural stock were largely local, and the seed, nursery, and animal breeding industries were only incipient. It is likely that the warrant for the identity and character of what was offered for sale rested on the purchaser's knowledge of the purveyor and his reputation. How subsequent competition from buyers was handled is largely unknown, but it may not have been an issue—if only because in this period the large majority of new animal breeds, as well as plant species and varieties, were not the product of effort and investment by improvers. They were imported to the United States, usually at the cost and with the encouragement of the federal government.[8] If breeders did invest in improvements, they likely commanded the local market enough to disregard or shame copycat competitors, or they may have considered their efforts a pro bono service to the community, finding reward enough in the admiration of the local agricultural society.

Attention to IP protection for plants and animals loomed larger after the Civil War, for several likely reasons. Regional and national agricultural markets emerged with the construction of the railroads and amid increasing urban demand for meats, fruits, and vegetables, as well as ornamental plants, trees, flowers, and shrubs.[9] The number of animal breeders, orchardists, and nurserymen was growing. Eager to be competitive, the proprietors of these enterprises felt the need to offer new and superior breeds or varieties as often as possible. But in doing business across vast, impersonal distances, animal and plant improvers could rely much less on reputation to warrant the identity and quality of their products. And the distance as well as the impersonality of the buyer-seller relationship made it all the easier for purchasers to propagate an improver's innovation and sell it as their own.

By the late nineteenth century, breeders of purebred Shorthorn cattle had devised a system for protecting the IP in their animals that was responsive to these circumstances. Drawing on methods pioneered by the English breeder Robert Bakewell in the late eighteenth century, they bred through pedigree, selecting for valuable characters and intensifying their embodiment in the animals through inbreeding.[10] The resulting purebreds likely tended to possess a feature essential to IP licensing—intergenerational reliability, which is to say that the products of their stud service were likely to resemble them.

Warranting the identity of the animals was achieved by registering the pedigrees in publicly available studbooks. The books—originally imported from England, along with the breed—were developed by private entrepreneurs in different states, and by the late nineteenth century they were increasingly characterized by nonuniformity in standards, sloppiness in the records, and general unreliability. As warrants of identity, they left a good deal to be desired. To solve that problem, the Shorthorn breeders moved in 1876 to regulate their market to a degree by forming the American Shorthorn Association. The association bought the existing registry books and amalgamated them into one. The arrangement thus advantaged genuine Shorthorn breeders and protected buyers against fraudulent sellers—

[8] Cary Fowler, "The Plant Patent Act of 1930: A Sociological History of Its Creation," *Journal of the Patent and Trademark Office Society,* 2000, *82*:621–644, on pp. 622–623; Jack R. Kloppenburg, Jr., *First the Seed: The Political Economy of Plant Biotechnology,* 2nd ed. (Madison: Univ. Wisconsin Press, 2004), pp. 50–57; and Margaret Derry, *Bred for Perfection: Shorthorn Cattle, Collies, and Arabian Horses since 1800* (Baltimore: Johns Hopkins Univ. Press, 2003).

[9] Fowler, "Plant Patent Act of 1930," pp. 623–624.

[10] On Bakewell see Harriet Ritvo, "Possessing Mother Nature: Genetic Capital in Eighteenth-Century Britain," in *Early Modern Conceptions of Property,* ed. John Brewer and Susan Staves (London/New York: Routledge, 1995), pp. 413–426. See also H. Cecil Pawson, *Robert Bakewell: Pioneer Livestock Breeder* (London: Crosby Lockwoon, 1957).

that is, purveyors of putative Shorthorns whose animals were not registered with the association.[11]

This system for the protection of IP in Shorthorns was likely exemplary of the systems developed for other farm animals and, with some variation, for pets and racehorses. It did not firmly protect the IP developed by individual breeders, but it did protect very well the collective IP of the cartel of breeders represented by the breed association.[12] In all, the breed association/studbook system provided the degree and type of protection consistent with what could be done, given the state of biological and breeding knowledge, to specify the animal's hereditary essence, warrant its hereditary prowess, and transmit that hereditary essence to succeeding generations. Still, it remains an open historical question whether and how the purveyors of purebred animals or stud services managed to discourage purchasers from competing against them with the offspring of their animals. They may have done so through the terms of the sales contract or the stud agreement.

The principal IP-related problem for improvers of plants that were reproduced sexually—for example, corn, the grains, most vegetables, and flowers—was that they did not ordinarily breed true. Sellers of their seed thus could not guarantee the quality and character of any given crop.[13] Then, too, farmers could save seed from their crops and then plant them, sell them, or both, thus undercutting the improver's control of his IP in the plant. Under the circumstances, the nascent private seed industry paid little attention to IP protection. It was content to rely for new varieties on importation and on the innovations produced by the state agricultural experiment stations established by the Hatch Act in 1887. Of far greater concern than IP protection was the competition the seed trade faced from the federal government. Beginning in the 1830s, the U.S. Patent Office and then the U.S. Department of Agriculture distributed seed gratis to farmers—more than ten million packets annually in the 1890s—via members of Congress and their franking privilege. What the private seed industry wanted from the policy arena was not IP protection but an end to the public seed-distribution program, a campaign that succeeded in 1924.[14]

Innovations and improvements in asexually reproducible plants and trees—the foundation of the horticultural industry—came partly from the hybridizing work of breeders like Luther Burbank but in the overwhelming main from chance finds in the field and

[11] Derry, *Bred for Perfection* (cit. n. 8), pp. 15, 20–29, 34–36. For a more extensive discussion of the history of IP in animal breeding see Daniel J. Kevles, "Breeding, Biotechnology, and Agriculture: The Establishment and Protection of Intellectual Property in Animals since the Late Eighteenth Century," in *History and Epistemology of Molecular Biology and Beyond: Problems and Perspectives* (Preprint 310) (Berlin: Max-Planck-Institut für Wissenschaftsgeschichte, 2006), pp. 69–80.

[12] On the extension of the system for the protection of IP to other animals see Derry, *Bred for Perfection.* In 1891 Liberty Hyde Bailey, the prominent plant scientist and a professor at Cornell University, noted the value of the system: "There is no law to compel one to register an animal, but every breeder knows that it is only through registration that he can advertise, sell and protect blooded stock. And there is no intelligent purchaser who would think of negotiating for such stock without having obtained the testimony of the herd-book." Liberty Hyde Bailey, "Protection to the Originator of Varieties," report read at the meeting of the American Association of Nurserymen, 4 June 1891, printed in *Transactions of the American Association [of Nurserymen],* 3–13 June 1891, pp. 88–91.

[13] J. M. Thorburn & Company, of New York, warned buyers that they gave "no warranty, express or implied, as to description, quality, productiveness, or any other matter of any seeds, bulbs or plants they send out." Among the reasons was "*the well-known tendency of many vegetables to revert to their original types, notwithstanding the care of the seed-grower*": J. M. Thorburn & Co. catalogue [1908], copy in New York Botanical Gardens Archives, Catalogue Collection, Box 538.

[14] Fowler, "Plant Patent Act of 1930" (cit. n. 8), pp. 622–623; and Kloppenburg, *First the Seed* (cit. n. 8), pp. 61–65.

orchard.[15] The finds arose from bud sports or fortunate sexual pollinations, but once found they could be reproduced virtually identically by the nurturing of grafts or cuttings. Commercial nurseries acquired such finds, tested them for characteristics like sturdiness and fruit-bearing qualities, and then put them on the market. Stark Brothers Nursery and Orchards, based in Louisiana, Missouri, was one of the oldest and perhaps the largest such enterprise in the country. It sponsored an annual fair that encouraged farmers to submit their good fruits, including those of chance finds. In 1893, through this means, the firm learned about an apple tree that produced a luscious red fruit. The next year it bought the tree, with all propagation rights—which is to say all its IP—from its owner, a farmer in Iowa. Stark named the fruit the "Delicious" apple and proceeded to market the tree to the world.[16]

Nurserymen and orchardists could be confident that the young trees they sold would bear fruit very much like that on the trees from which they had been derived. Yet the ease with which, say, valuable fruit trees could be reproduced virtually identically, through grafting, and thus numerously multiplied facilitated theft of the developer's IP. Competitors could purchase the trees, or take cuttings of them from someone's nursery in the dead of night, then propagate and sell them. Burbank tried to protect himself against such thieves by telling buyers that the way to judge novel fruits was to **"'look to their source,'** and also **if possible purchase direct from the originator."** He also charged high prices for his innovations—say, $3,000 for a new plum tree, including all "stock and control"—thus attempting to gain in the initial sale revenue that would cover his costs and return a reasonable profit.[17] The pricing strategy was intended to capture what economists call all the discounted downstream revenues of which thieves might deprive him, since he would be unable to control the reproduction of the tree once he had sold it. Trouble was that the high first-sale pricing did not work very effectively to compensate horticultural innovators for the loss of IP in their new fruit trees. Nurserymen repeatedly complained that they failed to receive just returns for all their investments of time and money because their innovations in plants and trees were quickly stolen.[18]

As an innovator, Burbank was largely in the business of selling to nurseries and orchardists, middlemen who would propagate his trees and sell them to gardeners, farmers,

[15] Bailey, "Protection to the Originator of Varieties" (cit. n. 12), pp. 88–89. For a pioneering scholarly account of horticulture in nineteenth-century America see Philip J. Pauly, *Fruits and Plains: The Horticultural Transformation of America* (Cambridge, Mass.: Harvard Univ. Press, forthcoming).

[16] Dickson Terry, *The Stark Story: Stark Nurseries' 150th Anniversary* (Columbus: Missouri Historical Society, 1966), pp. 38–40.

[17] *New Creations in Fruits and Flowers, June 1893* [catalogue] (Santa Rosa, Calif.: Burbank's Experimental Grounds, 1893), p. 12; and *Twentieth Century Fruits, 1911–1912* [catalogue] (Santa Rosa, Calif.: Burbank's Experiment Farms, 1911), p. 1: copies in Luther Burbank Papers, Library of Congress, Washington, D.C., Box 14. The boldface type is in the original.

[18] Burbank fulminated to the readers of *Green's Fruit Grower* that he had "been robbed and swindled out of my best work by name thieves, plant thieves and in various ways too well known to the originator. . . . A plant which has cost thousands of dollars in coin and years of intensest [*sic*] labor and care and which is of priceless value to humanity may now be stolen with perfect impunity by any sneaking rascal. . . . Many times have I named a new fruit or flower and before a stock could be produced some horticultural pirate had either appropriated the name, using it on some old, well-known or inferior variety or stealing the plant and introducing it as their own, or offering a big stock as soon as the originator commences to advertise the new variety." Luther Burbank to Jacob Moore, 4 May 1898, published in *Green's Fruit Grower,* June 1898, clipping in Luther Burbank Papers, Luther Burbank Home and Gardens, Archives, Santa Rosa, California, Scrapbooks, Vol. 2, p. 45. See also Moore to Chas. A. Green, 20 Apr. 1898; "Protection for Fruit Evolvers" [editorial], *California Fruit Grower,* n.d.; and Moore to Peter Gideon, n.d., *Green's Fruit Grower*: Luther Burbank Papers, Luther Burbank Home and Gardens, Archives, Scrapbooks, Vol. 2, pp. 44, 47, 115.

and other consumers. Stark Brothers, which did not breed new fruit trees but only acquired them, was in the business of mass marketing. Realizing the value of their IP by charging high prices would have been counterproductive to their business plan. To protect the IP in their fruit trees, the Starks trademarked them.[19] The trademark, however, did not necessarily prevent someone from obtaining the tree or cuttings from it, propagating the wood, and then selling the tree under a different name.

Under the circumstances, beginning in the 1880s and with mounting insistence in the 1890s, American nurserymen began urging the establishment of legal protection for what they called the rights of "originators." Some recommended the expansion of the patent system to include coverage for innovations in plants and trees. Mindful of their exclusion from the patent system, nurserymen wondered why, as the *California Fruit Grower* put it, "the writer of a book, the composer of a song, the designer of a drawing or the originator of a mechanical device should be protected in their productions, while the originator of an improved flower or fruit is denied the same privilege."[20]

The move to patentability was blocked, however, in 1889 when, in *Ex parte Latimer,* the U.S. Commissioner of Patents rejected an application for a patent to cover a fiber identified in the needles of a pine tree, declaring that it would be "unreasonable and impossible to allow patents upon the trees of the forest and the plants of the earth." The ruling constituted formal enunciation of the "product-of-nature" doctrine that the Patent Office would invoke in the Chakrabarty case.[21]

In 1895, trademark protection for fruit trees similarly fell to the ruling of a federal appeals court in the case of *Hoyt et al. v. J. T. Lovett Co.* James Hoyt and Edwin Hoyt, nurserymen in Connecticut, had sued the J. T. Lovett Nursery, in New Jersey, for selling a grape that had been found in the Green Mountains in Vermont. The Hoyts believed they had bought the grape wood with exclusive rights, and they had trademarked it as the "Green Mountain Grape." The court found against the Hoyts, partly on grounds that trademark law did not cover living products, holding:

> The Hoyts did not make the Green Mountain vine, nor, strictly speaking, did they produce it. It grew out of the earth, was fashioned by nature, and endowed with powers and qualities which no human ingenuity or skill could create or imitate. If such protection as that now claimed by the complainants was allowed, a breeder of cattle could with equal propriety and reason demand like protection for the natural increase of his herd. In every aspect such claims would seem to be impracticable and inequitable.[22]

During the next decade the leading nurseries, including Burbank and Stark Brothers, moved to obtain federal legislation for IP protection of their products. In 1906 they suc-

[19] See, e.g., the cover of the *Stark Nurseries Fruit Book,* 1895, depicting the Gold Plum with the caption "Trade Mark Pat'd 1895," in Luther Burbank Papers, Luther Burbank Home and Gardens, Archives, Scrapbooks, Vol. 1, p. 141.

[20] "Protection for Fruit Evolvers" [editorial], *California Fruit Grower,* quoted in Luther Burbank, Burbank's Experiment Farms, *The 1899 Supplement to New Creations in Fruits and Flowers* [catalogue], Luther Burbank Papers, Library of Congress, Box 14.

[21] *Ex Parte Latimer,* 12 Mar. 1889, C.D., 46 O.G. 1638, U.S. Patent Office, *Decisions of the Commissioner of Patents and of the United States Courts in Patent Cases . . . 1889* (Washington, D.C.: Government Printing Office, 1890), pp. 123–127. See also H. Thorne, "Relation of Patent Law to Natural Products," *Journal of the Patent Office Society,* 1923, *6*:23–28. In a report to the American Association of Nurserymen in 1891, Bailey had observed that patents on new horticultural varieties were unwarranted because most were not inventions but accidental volunteers found in the fields: Bailey, "Protection to the Originator of Varieties" (cit. n. 12), pp. 88–89.

[22] *Hoyt et al. v. J. T. Lovett Co.,* Circuit Court of Appeals, Third Circuit, 71 F.173, 3 Dec. 1895.

ceeded in having a bill introduced in the House that would amend the Trademark Act by authorizing the Commissioner of Patents to register an originator's new variety of plant, bush, shrub, tree, or vine, with the proviso that registration of the name would constitute a trademark and would include for twenty years the "exclusive right to propagate for sale and vend such variety of horticultural product under the name so registered." The bill enjoyed broad support from nurserymen, a number of whom explained to the House Committee on Patents that their innovations were frequently pirated. But while several committee members expressed sympathy for protecting the rights of the originators, the leadership found the bill before it constitutionally dubious, not least on grounds that by trying to protect rights in a product by protecting rights to the name, it sought to combine the exclusivity of a patent with the coverage of a trademark.[23]

Although it failed at the time, the 1906 venture led to the formation of a lobbying group, the National Committee on Plant Patents, under the American Association of Nurserymen. In 1929 Paul Stark, of Stark Brothers, became chair of the committee. Along with other nurseries, Stark Brothers had been trying to protect its propagation rights in new fruits by imposing contractual obligations on the purchaser—for example, an agreement not to sell or give away scions, cuttings, or buds. However, the contracts were sometimes difficult to enforce, which helped energize Stark's eagerness for the stronger IP protection that a patent would provide; and in 1930, in part as the result of Stark's lobbying effort, Congress passed the Plant Patent Act.[24]

The act covered only asexually reproduced organisms, and it authorized a patent to anyone who "has invented or discovered and asexually reproduced any distinct and new variety of plant, other than a tuber-propagated plant."[25] Given its requirement of distinctiveness rather than usefulness, it was not a utility patent law. Nor did it qualify for the conventional legal bargain that granted the inventor a monopoly right in exchange for public knowledge of how the invention was produced so that others could innovate beyond it. The Plant Patent Act rather harkened back to the seventeenth century, when patents were granted as privileges in the market, royal dispensations to encourage commerce in new technologies, often from abroad, or to reward favorites. Indeed, the Plant Patent Act might well have been called the Stark Horticultural Privilege Act, not only because of Stark's role in its passage but because it granted a privilege of IP protection that was tailored to the needs of horticultural innovators.[26]

Nevertheless, for all its simultaneous restrictiveness and looseness, the act was the first statute passed anywhere in the world that extended patent coverage to living organisms. It helped pave the way for the 1970 passage of the Plant Variety Protection Act (PVPA),

[23] U.S. Congress, House of Representatives, Committee on Patents, *Arguments before the Committee . . . on H.R. 113570, Authorizing the Registration of the Names of Horticultural Products and to Protect the Same, March 28, 1906, 59th Cong.* (Washington, D.C.: Government Printing Office, 1906), pp. 3–5 (the quotation is from p. 5), 12–13. For nurserymen's views see, e.g., M. Crawford to F. T. F. Johnson, 19 Mar. 1906, *ibid.,* p. 10; for the committee members' and leaders' views see *ibid.,* pp. 4–5, 9.

[24] Bailey had suggested in 1891 that nurserymen use such contractual arrangements, and the court in *Hoyt et al.* had noted their acceptability in passing. See Bailey, "Protection to the Originator of Varieties" (cit. n. 12), p. 90; *Hoyt et al. v. J. T. Lovett Co.,* 71 F.173, 3 Dec. 1895; Fowler, "Plant Patent Act of 1930" (cit. n. 8), pp. 630–642; and Bugos and Kevles, "Plants as Intellectual Property" (cit. n. 3).

[25] Quoted in Fowler, "Plant Patent Act of 1930," p. 641.

[26] I am indebted to Mario Biagioli for this analogy. On patents as privileges see Miller and Davis, *Intellectual Property* (cit. n. 4), p. 5; and Jessica He, "'Hail to the Patents!' The Ethics, Politics, and Economics of the Early Modern Patent System in England" (Senior Essay, Program in Ethics, Politics, and Economics, Yale Univ., 2005), pp. 2–27.

which provided IP protection for sexually reproducing plants. The PVPA was passed in part to bring the United States into harmony with a European convention for similar protection that went into effect in 1968. It expressed both the ability of plant breeders by then to produce varieties that were distinctive, uniform, and stable—the criteria for protection that the plant had to meet—and the felt need to integrate American plant breeding into an IP regime that was increasingly global. Like the act that preceded it and the court decisions that followed it, the PVPA expressed the dynamic interaction of craft and scientific knowledge with the political economy of intellectual property in living organisms.[27]

[27] The European convention is UPOV, "L'union internationale pour la protection des obtentions végétales," or the "International Union for the Protection of New Plant Varieties." See Bugos and Kevles, "Plants as Intellectual Property" (cit. n. 3).