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THE PARABLE OF THE SEEDS: INTERPRETING THE PLANT VARIETY PROTECTION ACT IN FURTHERANCE OF INNOVATION POLICY

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THE PARABLE OF THE SEEDS

> With what can we compare the kingdom of God, or what parable shall we use for it? It is like a grain of mustard seed, which, when sown upon the ground, is the smallest of all the seeds on earth; yet when it is sown it grows up and becomes the greatest of all shrubs, and puts forth large branches, so that the birds of the air can make nests in its shade.[1]

Rhetoric matters.[2] Rhetorical choices affect all intellectual endeavors, but most of all those enterprises whose opposing sides are as likely to be swayed by mythology as by mathematics. Whenever policy prescriptions are "indeterminate with a vengeance,"[3] a page of cosmology is often worth a volume of economics.[4] Even when it "becomes so ingrained as to be almost invisible," "rhetoric has the very real effect of severely constraining our perception of a problem and its potential solutions."[5] In other words, *how* we pose normative legal questions "limits and disposes the way in which any answer . . . —right or wrong—may be given."[6]

What metaphor best describes innovation, a process that is "intangible, uncertain, unmeasurable, and often even unobservable"?[7] Choose carefully, for "static gains and losses" traceable to regulatory policy "are probably small compared to the historical gains in welfare resulting from innovation and productivity growth."[8] As an inspira-

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1 *Mark* 4:30–32. The New Testament offers two other renditions of the parable of the mustard seed. *See Matthew* 13:31–32; *Luke* 13:18–19.

2 Holly Doremus, *The Rhetoric and Reality of Nature Protection: Toward a New Discourse*, 57 WASH. & LEE L. REV. 11, 12 (2000).

3 F.M. SCHERER & DAVID ROSS, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE 519 (3d ed. 1990).

4 *Cf.* N.Y. Trust Co. v. Eisner, 256 U.S. 345, 349 (1921) (Holmes, J.) ("[A] page of history is worth a volume of logic.").

5 Doremus, *supra* note 2, at 12.

6 SUSANNE K. LANGER, PHILOSOPHY IN A NEW KEY: A STUDY IN THE SYMBOLISM OF REASON, RITE, AND ART 3 (3d ed. 1957).

7 Richard T. Rapp, *The Misapplication of the Innovation Market Approach to Merger Analysis*, 64 ANTITRUST L.J. 19, 27 (1995).

8 Paul L. Joskow & Nancy L. Rose, *The Effects of Economic Regulation*, *in* 2 HANDBOOK OF INDUSTRIAL ORGANIZATION 1449, 1484 (Richard Schmalensee & Robert D. Willig eds., 1989); *cf.* Ha-Joon Chang, *The Economics and Politics of Regulation*, 21 CAMBRIDGE J. ECON. 703, 721 (1997) (lamenting that "current discussions" on regulatory reform fail to "give adequate attention to considerations of dynamic efficiency"); Joskow & Rose, *supra*, at 1484 (lamenting how "so little effort has been devoted to measuring the effects of regulation on innovation and productivity growth").

tional allegory rather than a source of biological knowledge,[9] the parable of the mustard seed provides an ideal metaphorical framework for assessing innovation policy. "[F]aith as a grain of mustard seed" can move mountains, "and nothing will be impossible."[10] Innovation, no less than the mustard seed, is modest in its inception but magnificent when fully realized.

Within the realm of the life sciences, the seed bridges several real and metaphorical divides. Among drivers of evolution, two forces tower above all others. One of them is food. The other is sex.[11] Remarkably, the seed is both. "It is both means of production and, as grain [or fruit], the product."[12] Seed as phenotype is a mere chattel, perhaps lunch for another organism. Seed as genotype, however, is at

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9 Disputes over Jesus' reference to the mustard seed as the "smallest of all seeds" have at times overshadowed this parable. These disputes have no bearing on the parable, let alone on my modest use of it. In the thirteenth century, St. Albert the Great acknowledged the existence of smaller seeds even as he elaborated the parable of the mustard seed as a central allegory of the Christian faith. *See* STEPHEN F. WAILES, MEDIEVAL ALLEGORIES OF JESUS' PARABLES 108–13 (1987). Enlightened thinkers have long distinguished between the Bible as historical narrative and the Bible as mythology. *See, e.g.*, JAMES BARR, THE SCOPE AND AUTHORITY OF THE BIBLE 7 (1980) (assigning "the entire (and supremely important) primeval story" of "creation, . . . Noah and the flood, and so on" to the area of "myth and legend" rather than the realm of "history"); STEPHEN JAY GOULD, ROCKS OF AGES: SCIENCE AND RELIGION IN THE FULLNESS OF LIFE 81–82 (1999) (reporting how the Vatican, in the half-century between Pius XII and John Paul II, eventually acknowledged how the "growth of data" and "refinement of theory" had made it impossible for evolution to "be doubted by people of goodwill and keen intellect"). "The Bible uses the terms and expressions of the times of its writers" in order to "convey an infallible revelation" in "cultural terms and expressions" that can be "accommodated to the human mind." BERNARD RAMM, PROTESTANT BIBLICAL INTERPRETATION 192 (2d ed. 1956). Or, in the words of the Bible itself, each generation must discover "the mystery hidden for ages and generations but now made manifest to [God's] saints." *Colossians* 1:26. On the proper role of religion in environmental law and other enterprises informed by the life sciences, see generally Jim Chen, *Legal Mythmaking in a Time of Mass Extinctions: Reconciling Stories of Origin with Human Destiny*, 29 HARV. ENVTL. L. REV. 279 (2005).

10 *Matthew* 17:20; *cf. Luke* 17:6 ("If you had faith as a grain of mustard seed, you could say to [a] sycamine tree, 'Be rooted up, and be planted in the sea,' and it would obey you."). The "sycamine tree," something mentioned nowhere except the Gospel of Luke, is traditionally considered to be the black mulberry. *See* LEON MORRIS, THE GOSPEL ACCORDING TO ST. LUKE 280 (1988); *cf.* THE WYCLIFFE BIBLE COMMENTARY 1058 (Charles F. Pfeiffer & Everett F. Harrison eds., 1990).

11 Jim Chen, *Law as a Species of Language Acquisition*, 73 WASH. U. L.Q. 1263, 1278 n.99 (1995). *See generally* GEOFFREY F. MILLER, THE MATING MIND: HOW SEXUAL CHOICE SHAPED THE EVOLUTION OF HUMAN NATURE 8–9 (2000) (distinguishing between natural and sexual selection as evolutionary forces).

12 JACK RALPH KLOPPENBURG, JR., FIRST THE SEED: THE POLITICAL ECONOMY OF PLANT BIOTECHNOLOGY, 1492–2000, at 10 (1988).

once a set of instructions for assembling and operating a plant and a dynamic record of that plant's evolutionary history.[13] Whatever else might be said for the old biological slogan, this is one sense in which ontogeny truly does recapitulate phylogeny.[14] "The emerging ability to program genetic code" into seeds further "blurs the line between law and artifact, and promises to challenge long-held assumptions in the legal regime of ownership and control over . . . biological creations."[15]

Information embedded in seed is amenable to various forms of proprietary protection.[16] Indeed, disputes over the ownership of plant genetic material have yielded some of the most emotionally explosive battles over intellectual property, not least because narratives about agriculture and the environment dominate cosmological stories of origin.[17] The "intense spiritual feelings" derived from nature's "un-

13 *See generally* ANTOINE DANCHIN, THE DELPHIC BOAT: WHAT GENOMES TELL US (Alison Quayle trans., 2002).

14 In ordinary language, "ontogeny recapitulates phylogeny" means that any individual organism's life cycle replays the entire evolutionary history of that organism's species. Ernst Haeckel, who also coined the term "ecology," *see* STEPHEN JAY GOULD, ONTOGENY AND PHYLOGENY 76 n.* (1977), developed this convenient but sometimes misleading biological maxim. *Compare* GOULD, *supra*, at 76–78 (describing Haeckel's role in popularizing and in distorting Darwin's work), *with id.* at 202–06 (describing how the discovery of Mendelian genetics undermined Haeckel's work and rehabilitated that of his rival, Karl Ernst von Baer).

15 Dan L. Burk, *DNA Rules: Legal and Conceptual Implications of Biological "Lock-Out" Systems*, 92 CAL. L. REV. 1553, 1554–55 (2004).

16 *See* Joseph Straus, *Bargaining Around the TRIPS Agreement: The Case for Ongoing Public-Private Initiatives To Facilitate Worldwide Intellectual Property Transactions*, 9 DUKE J. COMP. & INT'L L. 91, 104 (1998).

17 *See, e.g.*, JOHN STEINBECK, EAST OF EDEN 411 (Penguin 2002) (1952) (stating that "there is one story in the world, and only one"); Milner S. Ball, *Stories of Origin and Constitutional Possibilities*, 87 MICH. L. REV. 2280 (1989); Robert M. Cover, *The Folktales of Justice: Tales of Jurisdiction*, 14 CAP. U. L. REV. 179, 180 & n.7 (1985) (describing the origins of law in "the sacred narratives of our world"). *Compare* Lynn White, *The Historical Roots of Our Ecological Crisis*, 155 SCI. 1203 (1967) (describing the Book of Genesis as the origin of the Judeo-Christian tradition's strictly instrumental attitude toward nature), *with* John Copeland Nagle, *Playing Noah*, 82 MINN. L. REV. 1171 (1998) (describing the story of Noah as the Judeo-Christian basis for advocating biodiversity conservation). *See generally* J. BAIRD CALLICOTT, EARTH'S INSIGHTS: A SURVEY OF ECOLOGICAL ETHICS FROM THE MEDITERRANEAN BASIN TO THE AUSTRALIAN OUTBACK 14 (1994) (identifying the "historical roots of European attitudes and values" on the environment); DAVID KINSEY, ECOLOGY AND RELIGION: ECOLOGICAL SPIRITUALITY IN CROSS-CULTURAL PERSPECTIVE (1995); JOHN PASSMORE, MAN'S RESPONSIBILITY FOR NATURE: ECOLOGICAL PROBLEMS AND WESTERN TRADITIONS (1974); Jim Chen, *Of Agriculture's First Disobedience and Its Fruit*, 48 VAND. L. REV. 1261 (1995); Jim Chen, *Webs of Life: Biodiversity Conservation as a Species of Information Policy*, 89 IOWA L. REV. 495,

fathomable complexity and . . . sublime beauty"[18] turn quickly into spite once humans attend the gritty business of making a living—or a killing—from natural resources. The deceptively simple act of planting seed conceals an enterprise "so vast that fully to comprehend it would require an almost universal knowledge ranging from geology, biology, chemistry and medicine to the niceties of the legislative, judicial and administrative processes of government."[19]

As an economic matter, seeds present no fewer problems for the law of intellectual property than do pharmaceutical products. Drugs are exceptionally susceptible to unauthorized duplication because they are durable, subject to intense demand, relatively inexpensive to produce, easily transported, and readily imitated at a minute fraction of the original research and development costs.[20] In their struggle against drug copying enterprises, pharmaceutical companies do not so much rue the loss of retail sales in less developed countries as they fear gray-market "leakage" of those drugs back into the lucrative markets of the developed world.[21] Like artistic creations and other public goods,[22] drugs heed no "natural physical barriers that exclude potential consumers," "may be held by more than one person at a time," can be distributed at "minimal or nonexistent" cost, and once disclosed face "no real barriers to free appropriation."[23] Seeds exhibit all of these characteristics.[24] They inject a further complication that does

598–602 (2004); Judith M. Green, *Retrieving the Human Place in Nature*, 17 ENVTL. ETHICS 381, 389–93 (1995).

18 DAVID TAKACS, THE IDEA OF BIODIVERSITY: PHILOSOPHIES OF PARADISE 255 (1996).

19 Queensboro Farms Prods., Inc. v. Wickard, 137 F.2d 969, 975 (2d Cir. 1943) (making this claim in the context of dairy production).

20 *See* Otto A. Stamm, *GATT Negotiations for the Protection of New Technologies*, 73 J. PAT. & TRADEMARK OFF. SOC'Y 680, 685 (1991).

21 *See* F.M. Scherer & Jayashree Watal, *Post-TRIPS Options for Access to Patented Medicines in Developing Nations*, 5 J. INT'L ECON. L. 913, 928 (2002) (describing this phenomenon as "parallel trade"). *See generally* K Mart Corp. v. Cartier, Inc., 486 U.S. 281 (1988) (describing legal measures designed to curb the "gray market").

22 *See* William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 J. LEGAL STUD. 325 (1989).

23 Dan L. Burk, *Protection of Trade Secrets in Outer Space Activity: A Study in Federal Preemption*, 23 SETON HALL L. REV. 560, 585 (1993); *see also* OFFICE OF TECH. ASSESSMENT, U.S. CONG., FINDING A BALANCE: COMPUTER SOFTWARE, INTELLECTUAL PROPERTY AND THE CHALLENGE OF TECHNOLOGICAL CHANGE 185 (1992) (explaining how "free riders" impede the efficient production of public goods). *See generally* ROBERT S. PINDYCK & DANIEL L. RUBINFELD, MICROECONOMICS 663–65 (2d ed. 1992) (describing the economics of public goods).

24 *See* ROBERT P. BENKO, PROTECTING INTELLECTUAL PROPERTY RIGHTS 16–17 (1987).

not afflict most other subjects of intellectual property. At least in the case of self-pollinating plants, seeds reproduce of their own accord. "Copying," often a deviant and difficult deed for would-be infringers in many other industries, is the definition of agriculture. Whether cultivating plants or raising animals, farmers specialize in inducing living organisms to reproduce. Plant breeders therefore face two sources of competitive pressure whenever they release seed into the market. Not only must they fend off competing breeders, but every customer is also a potential rival.[25] To be sure, drugs, music, and movies are easily pirated even in poor countries. But arable land and the ability to plant crops are truly ubiquitous. Dirt and green thumbs come cheap. "From the standpoint of a producer of innovation, the notion of a self-replicating invention presents as compelling a case for intellectual property intervention as can be imagined."[26]

This Article will focus on the Plant Variety Protection Act of 1970 (PVPA),[27] especially in light of that statute's 1994 amendments.[28] In the 2001 decision of *J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred International, Inc.*,[29] the Supreme Court finally conclusively held that sexually reproduced plants eligible for protection under the PVPA are also eligible for utility patents under the Patent Act.[30] *J.E.M. Ag Supply* thereby confirmed what the Board of Patent Appeals and Interferences had held in the wake of the Supreme Court's 1980 decision in *Diamond v. Chakrabarty*[31]: like "anything [else] under the sun that is made by man,"[32] new, useful, and nonobvious sexually reproduced plants not otherwise found in nature may be patented.[33] Although

25 *See* KLOPPENBURG, *supra* note 12, at 280.

26 Mark D. Janis & Jay P. Kesan, *U.S. Plant Variety Protection: Sound and Fury . . . ?*, 39 HOUS. L. REV. 727, 730 (2002); *cf.* Robin Feldman, *The Open Source Biotechnology Movement: Is It Patent Misuse?*, 6 MINN. J. L. SCI. & TECH. 117, 151 (2004) ("[M]ost technology does not replicate itself in the way that living organisms do. Technology generally is used as a tool to make something else or as a component in making something else but not to make a new version of itself, except perhaps in the case of certain software applications in which code replicates itself.").

27 Pub. L. No. 91-577, 84 Stat. 1542 (1970) (codified as amended in scattered sections of 7 and 28 U.S.C.).

28 *See* Plant Variety Protection Act Amendments of 1994, Pub. L. No. 103-349, 108 Stat. 3136 (codified in scattered sections of 7 U.S.C.).

29 534 U.S. 124 (2001).

30 35 U.S.C. §§ 1–376 (2000).

31 447 U.S. 303 (1980).

32 *Id.* at 309.

33 *See Ex parte* Hibberd, 227 U.S.P.Q. (BNA) 443 (B.P.A.I. 1985); *cf. Ex parte* Latimer, 1889 Dec. Comm'r Pat. 123, 126 (1889) (refusing to grant patents on "the trees of the forest and the plants of the earth"). Since 1930, utility patents on *asexually* reproduced plants (except those propagated by tubers) have been available under the

the availability of utility patents for plants may tempt us to dismiss the PVPA as "sound and fury signifying nothing,"[34] the PVPA remains a significant source of interest. In strictly practical terms, the twenty-year term of plant variety certificates will extend the life of the PVPA well into the future.[35] Moreover, in a world where conventional plant breeding techniques continue to hold the key to food security despite the presence of advanced genetic engineering,[36] the law may do well to retain an interest in a lower-cost source of intellectual property rights in plant genetic resources. Finally, the PVPA contains two exemptions not found in patent law. The PVPA entitles farmers to save protected seed. It also protects the right of competitors to use protected varieties in developing new hybrids or varieties. The PVPA's crop and research exemptions temper what would otherwise be that statute's greater appeal to plant breeders *vis-à-vis* the Patent Act. These exemptions are conspicuously absent from the Patent Act and have figured prominently in litigation over the PVPA.

Interpretive controversies involving the PVPA—or, for that matter, any other body of intellectual property law—should be resolved in favor of constitutional interest in "the Progress of Science and useful Arts."[37] All forms of intellectual property embody a deliberate bargain between the preservation of incentives to innovate and the broadest possible dissemination of knowledge. Patents, copyrights, plant variety protection certificates, and other forms of intellectual property are not and should not be "given as favors."[38] Rather, they "are meant to encourage invention by rewarding the inventor with the right, limited to a term of years . . . , to exclude others from the use of his [or her] invention."[39] Just as Congress intends the availability of

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Townsend-Purnell Plant Patent Act, 35 U.S.C. §§ 161–164. *See generally* Imazio Nursery, Inc. v. Dania Greenhouses, 69 F.3d 1560 (Fed. Cir. 1995); Yoder Bros., Inc. v. Cal.-Fla. Plant Corp., 537 F.2d 1347 (5th Cir. 1976); Cary Fowler, *The Plant Patent Act of 1930: A Sociological History of Its Creation*, 82 J. PAT. & TRADEMARK OFF. SOC'Y 621 (2000).

34 *See* Janis & Kesan, *supra* note 26, at 728; *cf.* WILLIAM SHAKESPEARE, MACBETH act 5, sc. 5.

35 *See* 7 U.S.C. § 2483(b) (2000). The term of protection extends twenty-five years for trees and vines. *See id.* § 2483(b)(1)(B).

36 *See* Jonathan Knight, *Crop Improvement: Dying Breed*, 421 NATURE 568 (2003); Ann Marie Thro & Paul Zankowski, *Classical Plant Breeding Is the Route to Food Security*, 422 NATURE 559 (2003). *See generally* Keith Aoki, *Malthus, Mendel, and Monsanto, Intellectual Property and the Law and Politics of Global Food Supply*, 19 J. ENVTL. L. & LITIG. 397 (2004).

37 U.S. CONST. art. I, § 8, cl. 8.

38 Sears, Roebuck & Co. v. Stiffel Co., 376 U.S. 225, 229 (1964).

39 *Id.*

copyrights "to stimulate artistic creativity for the general public good,"[40] Congress expects the PVPA "to afford adequate encouragement for research, and for marketing when appropriate, to yield for the public the benefits of new varieties."[41] "The greatest service which can be rendered any country is to add a useful plant to its culture," wrote Thomas Jefferson.[42] The PVPA should be read as though this aspiration pervaded all of its provisions.

Part I of this Article outlines the case for a substantive canon of statutory interpretation derived from the Constitution's requirement that federal intellectual property laws advance "the Progress of Science and useful Arts." Part II applies this canon to the PVPA. After introducing the statute, Part II addresses the PVPA's controversial crop and research exemptions. In addition to the statutory requirement that applicants for plant variety protection deposit reproductive material in a public repository, Part II discusses the practice of "seed-wrap" licensing as a contractual response to reproductive breeding, "brown-bag" sales, and other activities putatively conducted under the aegis of the PVPA's research and crop exemptions. The conclusion defends this Article's constitutionally informed approach to resolving these controversies under the PVPA.

I. HARMONIZING INTELLECTUAL PROPERTY WITH "THE PROGRESS OF SCIENCE AND USEFUL ARTS"

The United States Constitution not only authorizes Congress to "secur[e] for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries"; it also demands that such grants "promote the Progress of Science and useful Arts."[43] The succinct "twenty-seven words . . . which give Congress the power to legislate copyrights and patents . . . contain the only use of the *right* in the entire main body of the Constitution."[44] This clause is both a grant of power and a limitation on that grant. It is the sole constitutional grant of power that "begins with a prescription of proper legis-

40 Twentieth Century Music Corp. v. Aiken, 422 U.S. 151, 156 (1975).

41 7 U.S.C. § 2581 (2000); *accord, e.g.*, Asgrow Seed Co. v. Winterboer, 513 U.S. 179, 181 (1995); Delta & Pine Land Co. v. Sinkers Corp., 177 F.3d 1343, 1350 (Fed. Cir. 1999).

42 THE GARDEN AND FARM BOOKS OF THOMAS JEFFERSON 509 (Robert C. Baron ed., 1987).

43 U.S. CONST. art. I, § 8, cl. 8.

44 David Ladd, *The Harm of the Concept of Harm in Copyright*, 30 J. COPYRIGHT SOC'Y 421, 425 (1983).

lative purpose."[45] Indeed, the framers of the Constitution enumerated this power within the federal government's fundamental charter in order to impose "express limitations" upon it.[46] By virtue of its statement of purpose, the patent and copyright clause is arguably the most dynamic of provisions in a Constitution filled with dynamic provisions.[47] At an absolute minimum, "the Progress of Science and useful Arts" contemplates at least as much social change as any other constitutional phrase, such as "unreasonable searches and seizures,"[48] "cruel and unusual punishments,"[49] and "Commerce among the several States."[50] No less than even "due process of law," faith in "the Progress of Science and useful Arts" expresses the expectation that "[o]ur Constitution [as] a covenant running from" generation to generation enables each generation to reject "anew . . . ideas and aspirations" not fit to "survive more ages than one."[51]

"The primary purpose of our patent system is not reward of the individual but the advancement of the arts and sciences. Its inducement is directed to disclosure of advances in knowledge which will be beneficial to society; it is not a certificate of merit, but an incentive to disclosure."[52] Proprietary protection of ideas should be designed to spur "release to the public of the products of . . . creative genius";

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45 Paul J. Heald & Suzanna Sherry, *Implied Limits on the Legislative Power: The Intellectual Property Clause as an Absolute Constraint on Congress*, 2000 U. ILL. L. REV. 1119, 1153; *see also* Edward C. Walterscheid, *To Promote the Progress of Science and Useful Arts: The Background and Origin of the Intellectual Property Clause of the United States Constitution*, 2 J. INTELL. PROP. L. 1, 32–33 (1994).

46 1 WILLIAM W. CROSSKEY, POLITICS AND THE CONSTITUTION IN THE HISTORY OF THE UNITED STATES 486 (1953); Heald & Sherry, *supra* note 45, at 1154 & n.274.

47 *Cf.* U.S. CONST. pmbl. (describing the Constitution as having been adopted "in Order to . . . secure the Blessings of Liberty to ourselves and our Posterity"); McCulloch v. Maryland, 17 U.S. (4 Wheat.) 316, 415 (1819) (Marshall, C.J.) ("This provision is made in a constitution, intended to endure for ages to come, and consequently, to be adapted to the various *crises* of human affairs.").

48 *See* Kyllo v. United States, 533 U.S. 27, 31 (2001).

49 *See* Trop v. Dulles, 356 U.S. 86, 101 (1958) (plurality opinion) (Warren, C.J.) (describing the Eighth Amendment as responsive to "evolving standards of decency").

50 *See generally* Gibbons v. Ogden, 22 U.S. (9 Wheat.) 1 (1824); William N. Eskridge, Jr. & John Ferejohn, *The Elastic Commerce Clause: A Political Theory of American Federalism*, 47 VAND. L. REV. 1355 (1994).

51 Planned Parenthood v. Casey, 505 U.S. 833, 901 (1992).

52 Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 330–31 (1945); *see also* Feist Publ'ns, Inc. v. Rural Tel. Serv. Co., 499 U.S. 340, 349 (1991) ("The primary objective of copyright is not to reward the labor of authors, but '[t]o promote the Progress of Science and useful Arts.'"); Twentieth Century Music Corp. v. Aiken, 422 U.S. 151, 156 (1975) (same).

incidental "reward to the owner [is] a secondary consideration."[53] Introducing an idea to the global community in the broadest sense is the very purpose of intellectual property.[54] "[I]n respect to works already created," however, any grant of intellectual property "*creates no economic incentive at all.*"[55]

A patent "is a privilege which is conditioned by a public purpose": a spur to innovation and a product of realized invention, a patent "is limited to the invention which it defines."[56] Since "the marginal cost of producing information, knowledge, or culture is zero,"[57] information should presumptively be as "free as the air to common use."[58] Proprietary exceptions to that general rule are justified solely to the extent that they overcome the so-called "appropriability problem." Although unfettered access to information ordinarily provides the ideal environment for human creativity, a lower, "indeed suboptimal level of innovation" may result if a would-be inventor cannot "recover the costs of invention because the resulting information [is] available to all."[59]

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53 United States v. Paramount Pictures, Inc., 334 U.S. 131, 158 (1948); *accord, e.g.*, Mazer v. Stein, 347 U.S. 201, 219 (1954). Admittedly, the second sentence of 35 U.S.C. § 103(a) (2000), which provides that "[p]atentability shall not be negatived by the manner in which the invention was made," was added to the statute in 1952, *see* Act of July 19, 1952, ch. 950, § 103, 66 Stat. 792, 798, in order to counteract earlier judicial suggestions that an inventor's eligibility for a patent hinged on his or her showing of a "flash of genius," *see* H.R. REP. No. 1923, at 18 (1952).

54 *See* Fox Film Corp. v. Doyal, 286 U.S. 123, 127 (1932) ("The sole interest of the United States and the primary objective in conferring the monopoly lie in the general benefits derived by the public from the labor of authors.").

55 Eldred v. Ashcroft, 537 U.S. 186, 257 (2003) (Breyer, J., dissenting); *cf.* Dennis S. Karjala, *The Term of Copyright* (observing how the protection of existing work constitutes an economically destructive, preemptive strike against future innovation), *in* GROWING PAINS: ADAPTING COPYRIGHT FOR LIBRARIES, EDUCATION, AND SOCIETY 33, 42–44 (Laura N. Gasaway ed., 1997).

56 Mercoid Corp. v. Mid-Continent Inv. Co., 320 U.S. 661, 666 (1944).

57 Yochai Benkler, *Freedom in the Commons: Towards a Political Economy of Information*, 52 DUKE L.J. 1245, 1252 (2003).

58 Int'l News Serv. v. Associated Press, 248 U.S. 215, 250 (1918) (Brandeis, J., dissenting).

59 Kenneth W. Dam, *The Economic Underpinnings of Patent Law*, 23 J. LEGAL STUD. 247, 247 (1994). *But cf.* Michele Boldrin & David K. Levine, *The Case Against Intellectual Monopoly*, 45 INT'L ECON. REV. 327 (2004) (arguing that monopoly, especially when conferred through intellectual property, is neither a prerequisite to nor a necessary consequence of innovation and that intellectual property, as a practical matter, is more likely to stunt innovation and growth). This is the sense in which private property of any sort, including property in inventions and artistic works, shares the core mission of free trade, that of minimizing deadweight losses stemming from the failure

The contemporary law of intellectual property routinely falls short of its stated ideal of advancing the progress of science and the useful arts. The political economy of innovation policy exerts "inexorable pressure to recognize as an axiom the principle that if something appears to have substantial value to someone, the law must and should protect it as property."[60] The mere assertion of value represents a presumptive and often conclusive claim to property.[61] This romantic view of authorship is stifling innovation.[62] The maximalist tendency in contemporary intellectual property law is perhaps best illustrated by *Eldred v. Ashcroft*,[63] the 2003 decision in which the Supreme Court upheld the Copyright Term Extension Act of 1998[64] over objections that retroactive extensions of existing copyrights violated the Constitution's requirement that rights for inventors and authors be granted for "limited Times."

Precisely because the Supreme Court is reluctant to enforce substantive limits on Congress's power to grant patents, copyrights, and comparable forms of intellectual property, the legal system must resort to more creative ways of vindicating the underenforced constitutional interest in "the Progress of Science and useful Arts."[65] Courts should interpret intellectual property laws in light of this explicit (if occasionally undervalued) constitutional aspiration. In the specific context of copyright, *Eldred*'s suggestion that "First Amendment scrutiny is unnecessary" when "Congress has not altered the traditional contours of copyright protection"[66] clearly implies that significant "First Amendment scrutiny *is* in order when Congress has altered those contours."[67] Though the First Amendment's guarantee of free

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of private parties to complete economically efficient transactions. *See* Robert C. Ellickson, *Property in Land*, 102 YALE L.J. 1315, 1326 (1993).

60 Jessica Litman, *Breakfast with Batman: The Public Interest in the Advertising Age*, 108 YALE L.J. 1717, 1725 (1999).

61 *See* Rochelle Cooper Dreyfuss, *Expressive Genericity: Trademarks as Language in the Pepsi Generation*, 65 NOTRE DAME L. REV. 397, 405 (1990).

62 *See, e.g.*, Julie E. Cohen, Lochner *in Cyberspace: The New Economic Orthodoxy of "Rights Management,"* 97 MICH. L. REV. 462 (1998); Mark A. Lemley, *Romantic Authorship and the Rhetoric of Property*, 75 TEX. L. REV. 873 (1997); Mark A. Lemley, *The Modern Lanham Act and the Death of Common Sense*, 108 YALE L.J. 1687, 1715 (1999).

63 537 U.S. 186 (2003).

64 Pub. L. No. 105-298, 112 Stat. 2827 (codified as amended in scattered sections of 17 U.S.C.).

65 *See* Lawrence G. Sager, *Fair Measure: The Legal Status of Underenforced Constitutional Norms*, 91 HARV. L. REV. 1212 (1978).

66 537 U.S. at 221.

67 Daniel A. Farber, *Conflicting Visions and Contested Baselines: Intellectual Property and Free Speech in the "Digital Millennium,"* 89 MINN. L. REV. 1318, 1349 (2005).

speech affects only copyright and not patent,[68] the inherent limitations on the Intellectual Property Clause govern all manifestations of that constitutional power. When confronted with multiple ways of interpreting an intellectual property statute, a court should be prepared to explain how its preferred construction advances the progress of science and useful arts. "[T]he patent system represents a carefully crafted bargain that encourages both the creation and *the public disclosure* of new and useful advances in technology, in return for an exclusive monopoly for a limited period of time."[69] Every grant of intellectual property strikes some balance between providing incentives for innovation and preserving public access to information. The Intellectual Property Clause of the Constitution "reflects a balance between the need to encourage innovation and the avoidance of monopolies which stifle competition without any concomitant advance in the 'Progress of Science and useful Arts.'"[70]

Rather than reading intellectual property laws without regard to their potential impact on innovation, courts should stress the distinctive elements of the Constitution's Intellectual Property Clause. Among other things, an insistence that rights follow affirmative contributions to knowledge and vigilant preservation of the public domain flow from the language of the Constitution and the implicit logic of the Supreme Court decisions it has inspired.[71] The Constitution's emphasis on "Inventors and Authors" demands that some sort of inventive or creative step be the basis for legal protection. Standing alone, the sweat of the brow is not enough.[72] Moreover, in order to ensure that such "exclusive Right[s]" as Congress confers do not exceed "lim-

68 On the relationship between the First Amendment and copyright law, see generally Marci A. Hamilton, *Art and the Marketplace of Expression*, 17 CARDOZO ARTS & ENT. L.J. 167 (1999); David McGowan, *Why the First Amendment Cannot Dictate Copyright Policy*, 65 U. PITT. L. REV. 281 (2004); William W. Van Alstyne, *Reconciling What the First Amendment Forbids with What the Copyright Clause Permits: A Summary Explanation and Review*, 66 LAW & CONTEMP. PROBS. 225 (2003).

69 Pfaff v. Wells Elecs., Inc., 525 U.S. 55, 63 (1998) (emphasis added); *see also* Bonito Boats, Inc. v. Thunder Craft Boats, Inc., 489 U.S. 141, 151 (1989); Brenner v. Manson, 383 U.S. 519, 533–34 (1966); Pennock v. Dialogue, 27 U.S. (2 Pet.) 1, 23 (1829).

70 *Bonito Boats*, 489 U.S. at 146.

71 *See* Heald & Sherry, *supra* note 45, at 1167 (outlining four principles—"suspect grant," "quid pro quo," "authorship," and "public domain"—that define the Supreme Court's "interpretive methodology in cases involving implied constitutional restraints" such as those imposed by the Intellectual Property Clause).

72 *See* Feist Publ'ns, Inc. v. Rural Tel. Serv. Co., 499 U.S. 340, 353–60 (1991).

ited Times" prescribed by the Constitution,[73] courts should vigorously uphold and enforce legal provisions that disclose the nature of an invention, enable other parties to exploit its underlying technology, and eventually transmit the knowledge gained to the public at large. At their inception, intellectual property rights may issue only if the recipient delivers a benefit that the public did not previously enjoy.[74] When intellectual property rights expire, the resulting infusion of knowledge into the public domain ensures that the "public will not be permanently deprived of the fruits of an artist's [or inventor's] labors."[75] The failure to ensure passage into the public domain as the crucial, truly public-regarding step of the transaction[76] would perversely reward those parties who are "least prompt to communicate their discoveries."[77] Even worse, it "would materially retard the progress of science and the useful arts."[78]

So formulated, this approach to interpreting intellectual property laws would add another substantive canon to the federal courts' already extensive list of heuristic rules that unapologetically favor some policy-oriented way of reading certain statutes.[79] From the rule of lenity in criminal law[80] to the presumption that Indian tribes are immune from state regulation,[81] substantive canons advance legal interests that transcend the precise words of individual statutes. For example, sec-

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73 *Cf.* Wheaton v. Peters, 33 U.S. (8 Pet.) 591, 661 (1834) ("[I]t has never been pretended . . . that an inventor has a perpetual right, at common law, to sell the thing invented.").

74 *See Brenner*, 383 U.S. at 534; Heald & Sherry, *supra* note 45, at 1162; Robert A. Kriess, *Patent Protection for Computer Programs and Mathematical Algorithms: The Constitutional Limitation on Patentable Subject Matter*, 29 N.M. L. REV. 31, 60 (1999).

75 Stewart v. Abend, 495 U.S. 207, 228 (1990); *cf.* Graham v. John Deere Co., 383 U.S. 1, 6 (1965) ("Congress may not authorize the issuance of patents whose effects are to remove existent knowledge from the public domain, or to restrict free access to materials already available.").

76 *See* Sears, Roebuck & Co. v. Stiffel Co., 376 U.S. 225, 229 (1964); Kellogg Co. v. Nat'l Biscuit Co., 305 U.S. 111, 120–22 (1938); Singer Mfg. Co. v. June Mfg. Co., 163 U.S. 169, 185 (1896).

77 Pennock v. Dialogue, 27 U.S. (2 Pet.) 1, 19 (1829).

78 *Id.*

79 *See* James J. Brudney & Corey Ditslear, *Canons of Construction and the Elusive Quest for Neutral Reasoning*, 58 VAND. L. REV. 1 (2005); William N. Eskridge, Jr. & Philip P. Frickey, *Quasi-Constitutional Law: Clear Statement Rules as Constitutional Lawmaking*, 45 VAND. L. REV. 593 (1992) [hereinafter Eskridge & Frickey, *Quasi-Constitutional Law*]; William N. Eskridge, Jr. & Philip P. Frickey, *The Supreme Court, 1993 Term—Foreword: Law as Equilibrium*, 108 HARV. L. REV. 26 (1994).

80 *See, e.g.*, Muscarello v. United States, 524 U.S. 125 (1998).

81 *See, e.g.*, Bryan v. Itasca County, 426 U.S. 373 (1976).

tion 102 of the National Environmental Policy Act (NEPA)[82] establishes a substantive canon that urges courts to interpret statutes in favor of aggressive environmental protection: "The Congress authorizes and directs that, to the fullest extent possible . . . the policies, regulations and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in" NEPA.[83] This language unambiguously requires the environmental laws of the United States to be interpreted and implemented so that they address all significant environmental risks, for the benefit of future generations as well as today's citizenry, to the limits of economic feasibility.[84]

To be sure, substantive canons of statutory interpretation do have their drawbacks. Especially when they draw upon the Constitution as a source of inspiration or authority, substantive canons represent a form of stealth constitutional law.[85] Aggressive interpretation of intellectual property statutes may open a back door to the very sort of active intervention that courts routinely forswear when they are asked to pass on the constitutionality of these enactments. After all, the very existence of federal intellectual property rights means that Congress has seen fit to grant some measure of "exclusive Rights," and courts must respect the exercise of legitimate legislative prerogative. Even the substantive canon prescribing narrow construction of public grants by the government to private parties,[86] the traditional canon that most closely resembles the intellectual property canon I am proposing, is not an inexorable command to foreclose private access to public lands and other government-owned resources. Public grants can sometimes be liberally interpreted when private benefits have been given in order to expedite some sort of great public purpose, such as the construction of the transcontinental railroad.[87] Similarly,

82 Pub. L. No. 91-190, § 102, 83 Stat. 852, 853–54 (1970).

83 42 U.S.C. § 4332 (2000).

84 *See* DANIEL A. FARBER, ECO-PRAGMATISM 126–27 (1999); Nicholas Yost, *NEPA's Promise—Partially Fulfilled*, 20 ENVTL. L. 533, 536 (1990).

85 *See* Eskridge & Frickey, *Quasi-Constitutional Law*, *supra* note 79, at 636–37; *cf.* Brudney & Ditslear, *supra* note 79, at 12–14 (distinguishing between putatively neutral "language canons" and "substantive canons" that are consciously intended "to reflect a judicially preferred policy position").

86 *See, e.g.*, United States v. Locke, 471 U.S. 84 (1985).

87 *See, e.g.*, Leo Sheep Co. v. United States, 440 U.S. 668, 682 (1979); Platt v. Union Pac. Ry. Co., 99 U.S. 48, 59 (1878) ("The work was vast, beyond the reach of private capital or enterprise. It could be accomplished only by the bestowal upon a corporation of very large governmental aid. . . . The construction of a [transcontinental] railroad . . . was most uninviting to private capitalists. To induce them to embark in the enterprise was the overshadowing motive that dictated the act of 1862."); *cf.*

the intellectual property canon should not uniformly constrict proprietary grants or facilitate the reckless award or extension of rights in intangible property,[88] but rather should be flexible enough to counsel either the enhancement or reduction of proprietary protection, as the societal interest in the creation and dissemination of inventions warrants.

Copyright and patent law already vindicate this constitutional interest in ways that are well understood. Under copyright law, the fair use doctrine[89] enables the law to resolve conflicts sparked by clashes between new technology and the proprietary rights of incumbents.[90] Fair use also facilitates price discrimination among purchasers with different levels of wealth and ability to find substitutes for copyrighted goods.[91] For its part, the Patent Act has a highly effective tool for facilitating the eventual transmission of patented information to the public domain.[92] Section 112 of the Patent Act provides:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled

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Kelo v. City of New London, 125 S. Ct. 2655 (2005) (permitting transfers between private property owners to satisfy the requirement that takings of property be for a "public use" under the Fifth Amendment).

88 *Cf.* Heald & Sherry, *supra* note 45, at 1169 (asserting that "[i]t is difficult to imagine a more overt violation" of the Constitution's concern for "the Progress of Science" than a "retroactive grant of copyright protection").

89 *See* 17 U.S.C. § 107 (2000) ("[T]he fair use of a copyrighted work . . . for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research, is not an infringement of copyright.").

90 *See, e.g.*, Wendy J. Gordon, *Fair Use as Market Failure: A Structural and Economic Analysis of the* Betamax *Case and Its Predecessors*, 82 COLUM. L. REV. 1600 (1982) (describing fair use as a legal response to market failure); Lydia Pallas Loren, *Redefining the Market Failure Approach to Fair Use in an Era of Copyright Permission Systems*, 5 J. INTELL. PROP. L. 1 (1997); Adrienne J. Marsh, *Fair Use and New Technology: The Appropriate Standards To Apply*, 5 CARDOZO L. REV. 635, 635–36 (1984) ("Successful resolution of the . . . tension between products of . . . new technolgies and copyright law will depend largely on the doctrine of fair use."); *cf.* Fred H. Cate, *The Technological Transformation of Copyright Law*, 81 IOWA L. REV. 1395 (1996) (urging a restoration of copyright law to the subject matter it covered before information came to dominate the economy).

91 *See* Michael Meurer, *Copyright Law and Price Discrimination*, 23 CARDOZO L. REV. 55 (2001); *cf.* Paul J. Heald, *Reviving the Rhetoric of the Public Interest: Choir Directors, Copy Machines, and New Arrangements of Public Domain Music*, 46 DUKE L.J. 241, 244–45 (1996) (calculating the increased cost of copyrighted music relative to music in the public domain).

92 *See* Rebecca S. Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, 56 U. CHI. L. REV. 1017, 1024 (1989).

> in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.[93]

By requiring every patent applicant to describe his or her invention in writing, § 112 enables comparably skilled experts to duplicate that invention once patent protection expires.[94] Disclosure through § 112 must teach those in the art to make and use the invention without undue experimentation.[95] The written description and enabling disclosure demanded by § 112 do more than raise hurdles to patenting in the first instance or limit the scope of the patents that are granted. These apparent formalities also facilitate the patent law's "ultimate goal": that of "bring[ing] new designs and technologies into the public domain through disclosure."[96]

The PVPA falls within the shadowy zone between the established copyright and patent "paradigms" of intellectual property law.[97] As a result, how the PVPA advances the progress of science and useful arts remains shrouded in mystery. This much is clear: the PVPA falls far short of the Patent Act's "extensive" requirements that an inventor describe his or her invention and disclose how it might be duplicated by others once the patent on that invention expires.[98] The PVPA's very vagueness on a point central to innovation policy demands the aggressive application of a substantive canon of interpretation that advances this constitutional interest. In passing the PVPA, Congress relied not only on its more general power "[t]o regulate Commerce . . . among the several States,"[99] but also on the Intellectual Property

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93 35 U.S.C. § 112 (2000).

94 *See* W.L. Gore & Assocs. v. Garlock, 721 F.2d 1540, 1556–58 (Fed. Cir. 1983); *In re* Howarth, 654 F.2d 103, 105–06 (C.C.P.A. 1981); *cf. In re* Wertheim, 541 F.2d 257, 262–63 (C.C.P.A. 1976) (distinguishing between § 112's two distinct requirements—namely, that the applicant provide a "written description" and that this description "enable[ ] [any] person skilled in the art" to duplicate the invention).

95 Hybritech, Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1384 (Fed. Cir. 1986); *accord, e.g.*, Genetech, Inc. v. Novo Nordisk A/S, 108 F.3d 1361, 1365 (Fed. Cir. 1997); *see also In re* Wands, 858 F.2d 731, 736–37 (Fed. Cir. 1988) (observing that a later practitioner of the relevant art may be required to conduct routine screening and other types of experimentation, as long as the necessary experimentation is not "undue").

96 Bonito Boats, Inc. v. Thunder Craft Boats, Inc., 489 U.S. 141, 151 (1989).

97 *See generally* J.H. Reichman, *Legal Hybrids Between the Patent and Copyright Paradigms*, 94 COLUM. L. REV. 2432 (1994); J.H. Reichman, *Charting the Collapse of the Patent-Copyright Dichotomy: Premises for a Restructured International Intellectual Property System*, 13 CARDOZO ARTS & ENT. L.J. 475 (1995).

98 J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc., 534 U.S. 124, 142–43 (2001) (quoting 7 U.S.C. § 2422(2) (2000)).

99 U.S. CONST. art. I, § 8, cl. 3.

Clause of the Constitution.[100] This declaration effectively invites courts to calibrate their interpretation of the PVPA according to the constitutional provision that simultaneously authorizes Congress to enact intellectual property laws and constrains any use of that power without regard to temporal limits or to "the Progress of Science and the useful Arts."[101] Though Congress may use its power over interstate commerce to protect some interests that it cannot reach through the Intellectual Property Clause,[102] the Commerce Clause cannot be treated as an open-ended license to evade the explicit, substantive limits on the Intellectual Property Clause. At the very least, courts should interpret the PVPA in light of its codified purpose of "afford[ing] adequate encouragement for research, and for marketing when appropriate, to yield for the public the benefits of new varieties."[103]

I turn now to an application of these admittedly abstract principles to decidedly concrete and specific controversies arising out of the PVPA.

II. INTERPRETING THE PVPA IN FURTHERANCE OF INNOVATION POLICY

A. The PVPA in Overview

The PVPA confers intellectual property on "[t]he breeder of any sexually reproduced or tuber propagated plant variety (other than fungi or bacteria) who has so reproduced the variety."[104] A "variety" is "a plant grouping within a single botanical taxon of the lowest known rank, that . . . can be defined by the expression of the characteristics resulting from a given genotype or a combination of genotypes."[105] In order to be eligible for protection under the PVPA, a plant variety must satisfy four requirements. First, it must be "new, in the sense that, on the date of filing of the application for plant variety protection, propagating or harvested material of the variety has not been sold or otherwise disposed of . . . for purposes of exploitation of the variety" for more than one year in the United States or more than four years in any foreign jurisdiction.[106] "[I]n the case of a tree or vine," the grace period for exploitation outside the United States is six years

100 *See* 7 U.S.C. § 2581 ("Constitutional clauses 3 and 8 of article I, section 8 are both relied upon.").

101 U.S. CONST. art. I, § 8, cl. 8.

102 *See* The Trade-Mark Cases, 100 U.S. 82, 97 (1879).

103 7 U.S.C. § 2581; *accord, e.g.*, Asgrow Seed Co. v. Winterboer, 513 U.S. 179, 181 (1995); Delta & Pine Land Co. v. Sinkers Corp., 177 F.3d 1343, 1350 (Fed. Cir. 1999).

104 7 U.S.C. § 2402(a).

105 *Id.* § 2401(a)(9).

106 *Id.* § 2402(a)(1).

prior to the date of filing.[107] Second, the variety must be "distinct, in the sense that the variety is clearly distinguishable from any other variety the existence of which is publicly known or a matter of common knowledge at the time of the filing of the application."[108] "The distinctness of one variety from another may be based on one or more identifiable morphological, physiological, or other characteristics (including any characteristics evidenced by processing or product characteristics, such as milling and baking characteristics in the case of wheat) with respect to which a difference in genealogy may contribute evidence."[109] Third, the variety must be "uniform, in the sense that any variations are describable, predictable, and commercially acceptable."[110] Finally, the variety must be "stable, in the sense that the variety, when reproduced, will remain unchanged with regard to the essential and distinctive characteristics of the variety with a reasonable degree of reliability commensurate with that of varieties of the same category in which the same breeding method is employed."[111]

A certificate of plant variety protection gives the breeder "the right . . . to exclude others from selling the variety, or offering it for sale, or reproducing it, or importing it, or exporting it, or using it in producing (as distinguished from developing) a hybrid or different variety therefrom."[112] The final component of the breeder's right, that of "exclud[ing] others from . . . using" a protected variety "in producing (as distinguished from developing) a hybrid or different variety," is echoed in the PVPA's definition of infringement.[113] In the absence of a statutory exemption from liability, the use of unlawfully secured samples of proprietary seed to develop a competing plant variety would violate the PVPA: "Except as otherwise provided in this subchapter, it shall be an infringement of the rights of the owner of a protected variety to . . . use the variety in producing (as distinguished from developing) a hybrid or different variety therefrom."[114]

The PVPA contains an intriguing limitation designed to preserve the "public interest in wide usage" in an otherwise protected variety.[115] The Secretary of Agriculture may "declare a protected variety open to use on a basis of equitable remuneration to the owner," but

107 *Id.* § 2402(a)(1)(B)(ii).
108 *Id.* § 2402(a)(2).
109 *Id.* § 2401(b)(5).
110 *Id.* § 2402(a)(3).
111 *Id.* § 2402(a)(4).
112 *Id.* § 2483(a)(1).
113 *Id.*
114 *Id.* § 2541(a)(4).
115 *Id.* § 2404.

only if the Secretary determines that compulsory licensing of a protected variety "is necessary in order to insure an adequate supply of fiber, food, or feed in this country and that the owner is unwilling or unable to supply the public needs for the variety at a price which may reasonably be deemed fair."[116] Compulsory licensing under this provision "shall remain in effect not more than two years."[117]

The PVPA's public interest provision represents merely a single instance in which the United States has consciously limited the reach of its intellectual property laws in order to advance competing public interests. James Madison and Alexander Hamilton favored a system of prizes and awards over the copyright and patent system that the Constitution eventually adopted.[118] Madison and Hamilton's counterparts elected copyrights and patents as a fiscally conservative alternative to direct subsidies from what was then a thin and precarious federal treasury.[119] Although intellectual property eventually prevailed as the United States' principal tool for motivating innovation, exceptions to the proprietary model abound throughout American law.[120]

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116 *Id.*

117 *Id.*

118 *See* Donald W. Banner, *An Unanticipated, Nonobvious, Enabling Portion of the Constitution: The Patent Provision—The Best Mode*, 69 J. PAT. & TRADEMARK OFF. SOC'Y 631, 637, 639 (1987).

119 *See* Walterscheid, *supra* note 45, at 39–40. *See generally* David McGowan, *Ethos in Law and History: Alexander Hamilton,* The Federalist, *and the Supreme Court*, 85 MINN. L. REV. 755 (2001) (describing Hamilton's plans to establish the creditworthiness of the new federal government and to spur industry throughout the infant Republic).

120 For instance, although civilian nuclear technology is ineligible for patents, Congress has authorized prizes in the interest of compensating inventors who work in this field. *See* 42 U.S.C. §§ 2181, 2183 (2000). Federal copyright law directs ad hoc arbitration panels to set reasonable royalties for a variety of works, including secondary transmissions by cable television systems, networks, and superstations; phonorecords of nondramatic musical works; public performance of musical compositions through jukeboxes; and artwork and music used in public radio and television broadcasts. *See* 17 U.S.C. §§ 114(d)(2), 119, 801, 802 (2000). The Clean Air Act authorizes the compulsory licensing of patented air pollution control technology. *See* 42 U.S.C. § 7608. By limiting a patent holder's remedy against unlicensed use or manufacture by the United States government to "reasonable and entire compensation for such [unlicensed] use and manufacture," American patent law effectively entitles the federal government to a compulsory license on any patented technology it sees fit to exploit. 28 U.S.C. § 1498(a) (2000). In response to a 1993 lawsuit alleging that an ophthalmologist had violated a patent on a technique for cataract surgery, *see* Pallin v. Singer, 36 U.S.P.Q.2d (BNA) 1050 (D. Vt. 1995)—evidently the first action in the United States that enforced a medical procedure patent against a physician, *see* William D. Noonan, *Patenting Medical and Surgical Procedures*, 77 J. PAT. & TRADEMARK OFF. SOC'Y 651, 653 (1995); John R. Thomas, *The Patenting of the*

To my knowledge, however, the PVPA's "public interest" provision has never been invoked. Evidently, at no time since 1970 has the United States approached so precarious a state of food security that the Secretary of Agriculture has felt compelled to compromise proprietary interests conferred under the PVPA.[121] The PVPA contains two further limitations of arguably greater interest to breeders and policymakers. The PVPA's extravagantly complicated and controversial "crop exemption" in principle permits a farmer "to save seed" from protected varieties and to "use such saved seed in the production of a crop."[122] The other exemption, known as the PVPA's "research exemption," declares simply that "[t]he use and reproduction of a protected variety for plant breeding or other bona fide research shall not constitute . . . infringement."[123]

These exemptions represent the most significant distinctions between the PVPA and the Patent Act. But for its crop and research exemptions, the PVPA might be the legal tool of choice for commercial plant breeders seeking to protect their investment in new plant

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Liberal Professions, 40 B.C. L. REV. 1139, 1176 (1999)—Congress barred the enforcement of patents on medical procedures against allegedly infringing physicians. *See* Medical Activity Act of 1996, Pub. L. No. 104-208, § 101(a), 110 Stat. 3009, 3009 (codified as amended at 35 U.S.C. § 287(c) (2000)). *See generally, e.g.*, Council on Ethical & Judicial Affairs, Am. Med. Ass'n, *Ethical Issues in the Patenting of Medical Procedures*, 53 FOOD & DRUG L.J. 341 (1998); Robert M. Portman, *Legislative Restriction on Medical and Surgical Procedure Patents Removes Impediment to Medical Progress*, 4 U. BALT. INTELL. PROP. L.J. 91, 111 (1996); Beata Gocyk-Farber, Note, *Patenting Medical Procedures: A Search for a Compromise Between Ethics and Economics*, 18 CARDOZO L. REV. 1527, 1544 (1997). *But cf.* Courtenay C. Brinckerhoff, *Medical Method Patents and the Fifth Amendment: Do the New Limits on Enforceability Effect a Taking?*, 4 U. BALT. INTELL. PROP. L.J. 147, 177 (1996) (concluding that a statutory limitation on the enforceability of these patents would constitute an unlawful taking without just compensation of the patentees' intellectual property interests in new medical methods).

121 *Cf.* Jim Chen, *Epiphytic Economics and the Politics of Place*, 10 MINN. J. GLOBAL TRADE 1, 33–34 (2001) ("The United States emerged from World War II with so much surplus agricultural capacity that it has been feeding the rest of the world ever since. . . . Only a nation that is obscenely rich by the West's historical standards and the larger world's contemporary standards can indulge in food aid either as a means of suppressing domestic supplies or as a tool for shaping foreign relations, much less both."). For background on the impact of law on global food security, see generally Aoki, *supra* note 36. On domestic food supply policy during the last period of serious food insecurity in American history, see Guadalupe T. Luna, *The New Deal and Food Insecurity in the "Midst of Plenty,"* 9 DRAKE J. AGRIC. L. 213 (2004). For an overview of contemporary American food aid policies that is as incisive as it is concise, see generally Vernon W. Ruttan, *Does Food Aid Have a Future?*, 80 AM. J. AGRIC. ECON. 572 (1998).

122 7 U.S.C. § 2543 (2000).

123 *Id.* § 2544.

varieties. Whereas "patents are relatively expensive to obtain and set a higher threshold for protection," plant variety protection "is easier and cheaper to obtain."[124] In contrast with the PVPA's relatively modest request for "a 'description of the variety' setting forth its distinctiveness, uniformity and stability and a description of the genealogy and breeding procedure, when known," the Patent Act demands far more "extensive" obligations of description and disclosure.[125] Nothing in the PVPA imposes the equivalent of the Patent Act's requirements of nonobviousness[126] and enablement.[127] In particular, the absence of a nonobviousness requirement "is a significant difference if one accepts that the nonobviousness criterion performs the principal work of discriminating between patent-worthy and patent-unworthy inventions."[128] In short, whereas the Patent Act offers robust protection in exchange for a comprehensive disclosure of the technology underlying a new plant variety, the PVPA grants much weaker protection upon delivery of a lower-quality disclosure.[129]

Given the historic difficulty that plant breeders have encountered in attempting to satisfy the Patent Act's description requirement,[130]

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124 Janis & Kesan, *supra* note 26, at 777.

125 J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc., 534 U.S. 124, 142–43 (2001) (quoting 7 U.S.C. § 2422(2)).

126 *See* 35 U.S.C. § 103 (2000) ("A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains."). On the impact of the nonobviousness requirement on high-risk, capital-intensive biotechnological research, see generally Karen I. Boyd, *Nonobviousness and the Biotechnology Industry: A Proposal for a Doctrine of Economic Nonobviousness*, 12 BERKELEY TECH. L.J. 311 (1997); Robert P. Merges, *One Hundred Years of Solicitude: Intellectual Property Law, 1900–2000*, 88 CAL. L. REV. 2187, 2225–26 (2000); Arti K. Rai, *Intellectual Property Rights in Biotechnology: Addressing New Technology*, 34 WAKE FOREST L. REV. 827 (1999).

127 *See* 35 U.S.C. § 112 ("The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.").

128 Janis & Kesan, *supra* note 26, at 748.

129 *See* Mark D. Janis & Jay P. Kesan, *Designing the Optimal Intellectual Property System for Plants: A U.S. Supreme Court Debate*, 19 NATURE BIOTECH. 981, 982 (2001).

130 *See* 35 U.S.C. § 112 ("The specification shall contain a written description of the invention, and of the manner and process of making and using it, . . . as to enable any person skilled in the art to which it pertains . . . to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention."); Diamond v. Chakrabarty, 447 U.S. 303, 312 (1980) (reporting that plants were

the PVPA provides an alternative, more accessible legal system in which the plant genome essentially speaks for itself. The PVPA's exemptions, however, have effectively diverted many plant breeders toward the Patent Act. In exchange for fulfilling the Patent Act's more rigorous process, plant breeders can evade the PVPA's research and crop exemptions.[131] Quite significantly, "the right to save seed of plants registered under the PVPA does not impart the right to save seed of plants patented under the Patent Act."[132] Patent-holders are also immune, unlike their counterparts whose varieties are protected only under the PVPA, from the use of a certified plant variety to develop a new inbred line. The PVPA defines the "use" of a protected "variety in producing . . . a hybrid or different variety" as infringement, but excludes from that definition the use of a protected variety in "developing" such a variety.[133]

In light of the salience of the PVPA's crop and research exemptions, the next two Parts of this Article will examine each of these exemptions in detail.

B. The Crop Exemption

Controversies over the PVPA's crop exemption trace their origin to the International Convention for the Protection of New Varieties of Plants.[134] This agreement's usual acronym, UPOV, is derived from the French name of the organization that administers the convention: *Union pour la Protection des Obtentions Végétales.* American accession in this treaty in 1970 committed the United States as a "Contracting Party [to] grant and protect breeders' rights."[135] UPOV authorizes its

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once thought "not amenable to the 'written description' requirement of the patent law" insofar as "new plants may differ from old only in color or perfume" and thus defy "differentiation by written description").

131 *See* J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc., 534 U.S. 124, 129 n.1, 140 (2001).

132 Monsanto Co. v. McFarling, 302 F.3d 1291, 1299 (Fed. Cir. 2002), *cert. denied*, 537 U.S. 1232 (2003); *see also* Burk, *supra* note 15, at 1571 ("Patents that overlap PVPA rights appear . . . to eradicate the exemptions in the PVPA.").

133 7 U.S.C. § 2541(a)(4) (2000); *see J.E.M.*, 534 U.S. at 143.

134 International Convention for the Protection of New Varieties of Plants, Dec. 2, 1961 (revised on Nov. 10, 1972, Oct. 23, 1978, and Mar. 19, 1991) [hereinafter UPOV], *available at* http://www.upov.int/en/publications/conventions/1991/act1991.

135 *Id.*; *see also id.* art. 14 (describing the scope of breeders' rights); *cf.* Agreement on Trade-Related Aspects of Intellectual Property Rights art. 27(3)(b), Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, Legal Instruments—Results of the Uruguay Round, 33 I.L.M. 1125, 1208 (committing members of the World Trade Organization to "provide for the protection of plant varieties

contracting parties to implement an optional limitation on breeders' rights in favor of farmers. This snippet of international law has dramatically affected the PVPA. Article 15 permits UPOV's signatory countries to adopt an exception endorsing the traditional agricultural practice of saving seed:

> [E]ach Contracting Party *may*, within reasonable limits and subject to the safeguarding of the legitimate interests of the breeder, restrict the breeder's right in relation to any variety in order to permit farmers to use for propagating purposes, on their own holdings, the product of the harvest which they have obtained by planting, on their own holdings, the protected variety . . . .[136]

On the authority of this provision in UPOV, Congress included an expansive "crop exemption" within section 113 of the PVPA. Section 113 has always allowed farmers who plant seed protected by a PVPA certificate to engage in a "bona fide sale for other than reproductive purposes, made in channels usual for such other purposes."[137] This uncontroversial aspect of the crop exemption protects farmer-to-market sales of a crop grown from protected seeds as food or feed or for other nonreproductive purposes.[138] Indeed, if the PVPA lacked this exemption, the statute would bar farmers from selling *any* protected crop whose seed is sold for food or fiber. Throughout the history of the PVPA, section 113 has also permitted farmers "to save seed produced by [them] from seed obtained, or descended from seed obtained, by authority of the owner of the variety for seeding purposes and [to] use such saved seed in the production of a crop" for on-farm use.[139] This facet of the crop exemption protects the traditional agricultural practice known as "bin run," or the use of seed from one crop to produce subsequent crops.[140] At least with respect to self-pollinated crops such as wheat, soybeans, and cotton, all of which reproduce true-to-type, legal protection of bin run effectively restricts a breeder to a single sale of each variety to each individual grower of a

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either by patents or by an effective *sui generis* system"), *reprinted in* WORLD TRADE ORGANIZATION, THE RESULTS OF THE URUGUAY ROUND OF MULTILATERAL TRADE NEGOTIATIONS 321 (1995). On the United States' accession in the 1970 and 1991 versions of the UPOV treaty, see generally S. EXEC. REP. NO. 105-15 (1998); H.R. REP. NO. 103-699, at 8–9 (1994), *as reprinted in* 1994 U.S.C.C.A.N. 2423, 2424–25; Janis & Kesan, *supra* note 26, at 742–45.

136 UPOV, *supra* note 134, art. 15(2) (emphasis added).

137 7 U.S.C. § 2543.

138 *See* Scott D. Wegner, *The Plant Variety Protection Act: Has the Farmer Exemption Swallowed the Act?*, AGRIC. L. UPDATE, Apr. 1992, at 4, 5.

139 7 U.S.C. § 2543.

140 *See* Wegner, *supra* note 138, at 4–5.

particular crop.[141] (Cross-pollinated hybrid crops such as corn, sorghum, and sunflowers are a different matter; because they lose hybrid vigor after a single planting, farmers must buy new seed each planting season.)[142] The bin run exemption is a robust version of copyright law's "first sale" doctrine[143]: the plant breeder gets exactly one chance to sell the information "encoded" in PVPA-certified seed to any individual farmer.

As enacted in 1970, however, section 113 also allowed "a person, whose primary farming occupation is the growing of crops for sale for other than reproductive purposes, to sell such saved seed to other persons so engaged, for reproductive purposes."[144] This version of the statute prevailed for nearly a quarter century. Its effect was plain: the old crop exemption enabled farmers to go directly into the business of selling PVPA-protected seeds alongside the plant breeders. In one of the earliest cases interpreting section 113, a federal court of appeals recognized the incompatibility between brown-bag sales under the crop exemption and the PVPA's overarching purpose of spurring the development of new plant varieties:

> In purpose and operation, the farmer exemption appears to be at odds with the primary purpose of the Act. While the main body of the Act assures developers of novel varieties the exclusive right to sell and reproduce that variety, the crop exemption dilutes that exclusivity by allowing individual farmers to sell the protected variety without liability. The broader the construction given the exemption, the smaller the incentive for breeders to invest the substantial time and effort necessary to develop new strains. The less time and effort that is invested, the smaller the chance of discovering superior agricultural products. If less time and effort is invested, long-term benefits to the farmer in the form of superior crops and higher yields will be lost.[145]

In what was then an authoritative interpretation of the brown-bagging provision, the Federal Circuit in 1992 allowed farmers to sell up to half of the crops they harvested from PVPA-certified seed in "brown-bag" transactions with other farmers.[146] Such brown-bag sales

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141 *See id.*

142 *See id. See generally* RATTAN LAL AGRAWAL, FUNDAMENTALS OF PLANT BREEDING AND HYBRID SEED PRODUCTION (1998).

143 *See* 17 U.S.C. § 109(a) (2000).

144 PVPA, Pub. L. No. 91-577, § 113, 84 Stat. 1542, 1555 (1970), *amended in part by* Plant Variety Protection Act Amendments of 1994, Pub. L. No. 103-349, § 10, 108 Stat. 3136, 3142.

145 Delta & Pine Land Co. v. Peoples Gin Co., 694 F.2d 1012, 1016 (5th Cir. 1983).

146 *See* Asgrow Seed Co. v. Winterboer, 982 F.2d 486, 490 (Fed. Cir. 1992), *rev'd*, 513 U.S. 179 (1995).

would be overtly and unapologetically intended for reproductive purposes. A dissenting judge objected that the Federal Circuit's permissive interpretation could have enabled an enterprising farmer, selling "only half of [each] crop . . . as seed in successive years," to flood the commercial seed market after three years with something "between 2,037 and 11,655 bushels of seed."[147] The inescapable mathematical logic of this situation begins with the recognition that a "single bushel of soybean seed will produce between 25 and 45 bushels of soybeans" and ends with the conclusion that a "single soybean seed, after three crops, [will] produce 27,000 seeds."[148]

The legal firestorm over brown-bagging would not go wholly unchecked. The judicial and legislative branches of the United States government eventually intervened. In the 1995 decision of *Asgrow Seed Co. v. Winterboer*,[149] the Supreme Court limited brown-bag sales to "only such seed as [a farmer] has saved for the purpose of replanting his own acreage."[150] While the *Asgrow Seed Co.* case awaited the Supreme Court's decision on the merits, Congress in 1994 repealed the brown-bagging provisions of the PVPA's crop exemption.[151] In conformity with the Supreme Court's presumptive refusal to grant retroactive effect to statutes,[152] *Asgrow* governed only cases filed under the PVPA as that statute read before its 1994 amendments; all post-1994 sales of seed protected under the PVPA have conveyed no brown-bagging privileges on farmers. Today the crop exemption provides:

> Except to the extent that such action may constitute an infringement under subsections (3) and (4) of section 2541 of this title, it shall not infringe any right hereunder for a person to save seed produced by the person from seed obtained, or descended from seed obtained, by authority of the owner of the variety for seeding purposes and use such saved seed in the production of a crop for use

147 Asgrow Seed Co. v. Winterboer, 989 F.2d 478, 480 n.2 (Fed. Cir. 1993) (Newman, J., dissenting from denial of rehearing en banc).

148 *Id.*

149 513 U.S. 179.

150 *Id.* at 192.

151 *See* Plant Variety Protection Act Amendments of 1994, Pub. L. No. 103-349, § 10, 108 Stat. 3136, 3142 (amending 7 U.S.C. § 2543); *Asgrow Seed Co.*, 513 U.S. at 184 n.2 (acknowledging the repeal of the brown-bagging provisions of the PVPA's crop exemption). *See generally* H.R. REP. NO. 103-699, at 8–10, 14–15 (1994) (describing Congress's reasons for repealing the crop exemption), *as reprinted in* 1994 U.S.C.C.A.N. 2423, 2430–31; 139 CONG. REC. 19,979–80 (1993) (statement of Sen. Kerrey, sponsor of the amendment to eliminate brown-bagging from the PVPA's crop exemption).

152 *See* Landgraf v. USI Film Prods., 511 U.S. 244, 273–80 (1994); Rivers v. Roadway Express, Inc., 511 U.S. 298, 311–12 (1994).

> on the farm of the person, or for sale as provided in this section. A bona fide sale for other than reproductive purposes, made in channels usual for such other purposes, of seed produced on a farm either from seed obtained by authority of the owner for seeding purposes or from seed produced by descent on such farm from seed obtained by authority of the owner for seeding purposes shall not constitute an infringement. A purchaser who diverts seed from such channels to seeding purposes shall be deemed to have notice under section 2567 of this title that the actions of the purchaser constitute an infringement.[153]

By eliminating farmers as a significant source of competition for commercially developed seed, the legislative rejection of brown-bagging restored much of the PVPA's value to commercial plant breeders. The 1994 amendment also represented a significant setback for the recognition of farmers' rights in American law.[154] Before the brown-bagging controversy reached its apex in *Asgrow*, at least one commentator had urged that the Patent Act be amended, along the lines of section 113 of the PVPA as originally enacted, to grant the full panoply of farmers' rights, including the ability to sell embryos and gametes of patented animals to other farmers on a "brown-bag" basis.[155] After the *Asgrow* fiasco and Congress's thorough repudiation in 1994 of the PVPA's brown-bagging provision, any proposal to cast patent law into similar disarray seems mercifully dead.

The PVPA's experience with brown-bagging sheds light on international efforts to harmonize the law of intellectual property and environmental protection. The United States has withheld ratification of treaties such as the Convention on Biological Diversity[156] out of a belief that legal instruments of this sort enable other countries to erode the profitability of the United States' life science industries.[157] The

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153 7 U.S.C. § 2543.

154 On the international legal status of "farmers' rights," namely, the traditional agricultural practice of saving seed for future planting, for resale to neighboring farmers, and perhaps even for development of other varieties through conventional cross-breeding, see Agreed Interpretation of the International Undertaking on Plant Genetic Resources, FAO Conference Res. 4189, § 3, 22d Sess., U.N. Doc. C89/24 (Nov. 29, 1989), *available at* ftp://ext-ftp.fao.org/ag/cgrfa/iu/iutextE.pdf (endorsing the "concept of Farmers' Rights" and acknowledging "that farmers of all regions have made" an "enormous contribution . . . to the conservation and development of plant genetic resources, which constitute the basis of plant production throughout the world").

155 *See* Robert P. Merges, *Intellectual Property in Higher Life Forms: The Patent System and Controversial Technologies*, 47 MD. L. REV. 1051, 1068–73 (1988).

156 June 5, 1992, 31 I.L.M. 818.

157 *See, e.g.*, Declaration Made at the United Nations Environment Programme Conference for the Adoption of the Agreed Text of the Convention on Biological

American experience with the PVPA and its crop exemption demonstrates that the United States is fully capable of damaging its own economic interests without foreign assistance. In retrospect, the damage done by section 113 to American plant breeders was a gratuitous, self-inflicted wound. American participation in UPOV did not commit the United States to restrict breeders' rights for farmers' benefit. Article 15 of UPOV carefully distinguished the "optional" farmers' rights provision from the three "compulsory" exceptions established by that treaty to breeders' rights: "(i) acts done privately and for non-commercial purposes, (ii) acts done for experimental purposes and (iii) acts done for the purpose of breeding other varieties."[158] To the extent that section 113 unraveled the PVPA, Congress inflicted that wound on itself by implementing an *optional* exception to breeders' rights under UPOV. In fact, a plant breeder might have plausibly argued that American law affirmatively offended UPOV to the extent that the pre-1994 version of section 113 entitled farmers to sell protected seeds "for propagating purposes" *outside* "their own holdings." Article 15 of UPOV, after all, authorized an optional limitation on breeders' rights for the purpose of "permit[ting] farmers to use for propagating purposes, *on their own holdings*, the product of the harvest which they have obtained by planting, *on their own holdings*, the protected variety."[159] The mandatory provisions of UPOV sanctioned nothing more than bin run; the original PVPA adopted a far more expansive exemption permitting brown-bag sales. A quarter-century later, Congress confined the crop exemption to the propagation of protected varieties for nonreproductive purposes and to bin run.

Diversity, U.S., May 22, 1992, 31 I.L.M. 848, 848 (documenting the United States' initial refusal to sign the Convention because of dissatisfaction with "the text's treatment of intellectual property rights; finances . . . ; technology transfer and biotechnology"); *Convention on Biological Diversity*, 3 DEP'T STATE DISPATCH 423 (1992) (describing how the first Bush administration believed that the Convention treated intellectual property rights "as a constraint to the transfer of technology rather than a prerequisite"); Karen Anne Goldman, *Compensation for Use of Biological Resources Under the Convention on Biological Diversity: Compatibility of Conservation Measures and Competitiveness of the Biotechnology Industry*, 25 LAW & POL'Y INT'L BUS. 695, 714 (1994) (describing the first Bush administration's objection to the Biodiversity Convention insofar as that treaty allegedly "requir[es] open access to research activities" and would thereby "effectively transfer technology at the expense of" intellectual property). *See generally* Robert F. Blomquist, *Ratification Resisted: Understanding America's Response to the Convention on Biological Diversity, 1989–2002*, 32 GOLDEN GATE U. L. REV. 493 (2002); Adam L. Streltzer, *U.S. Biotechnology Intellectual Property Rights as an Obstacle to the UNCED Convention on Biological Diversity: It Just Doesn't Matter*, 6 TRANSNAT'L LAW 271 (1993).

158 UPOV, *supra* note 134, art. 15(1).

159 *Id.* art. 15(2) (emphases added).

In other words, UPOV authorized an experiment to integrate an aggressive form of farmers' rights within a *sui generis* system of intellectual property rights for new plant varieties. That experiment failed miserably. The United States' renunciation of farmers' rights within the PVPA should serve notice to the rest of the world: farmers' rights are incompatible with biotechnology patents.

C. The Research Exemption

The PVPA generally withholds liability from "any act done privately and for noncommercial purposes."[160] The statute's more focused research exemption provides that "[t]he use and reproduction of a protected variety for plant breeding or other bona fide research shall not constitute . . . infringement."[161] "The presence of a research exemption separate from the noncommercial acts exemption may suggest that a competing plant breeder can [lawfully] appropriate a protected variety without authority" and "use it in a breeding program to develop new commercial varieties," at least as long as such new varieties are different enough not to be "'essentially derived'" from the original protected variety.[162] The interpretation of the research exemption is vital to the proper functioning of the PVPA, because its coverage, if misconstrued, could overlap entirely with the statute's definition of infringement. Congress expected that PVPA infringement would "almost never" arise through "independent work, but by willful reproduction starting from the protected variety itself."[163]

PVPA infringement almost invariably begins with a supply of protected seed. Coupled with sufficient knowledge of agronomy and a penchant for experimentation, access to PVPA-protected reproductive matter may enable other parties to propagate specimens of a protected plant for purposes other than feed, fiber, or food. This is true even of hybrids, which over the course of the twentieth century became "the predominant form of cultivar in many crops."[164] Traditionally associated with allogamous, or cross-pollinating, crops such as "maize, sunflower, brassicas, curcurbits, carrots, beets, and onions," the use of hybrid cultivars has become common even "in certain autogamous [i.e., self-pollinating] crops, including sorghum, tomato, and peppers" and in the production of allogamous crops in nonindus-

160 7 U.S.C. § 2541(e) (2000).

161 *Id.* § 2544.

162 Janis & Kesan, *supra* note 26, at 751.

163 S. REP. NO. 91-1138, at 11 (1970).

164 Arnel R. Hallauer, *Breeding Hybrids*, *in* ENCYCLOPEDIA OF PLANT AND CROP SCIENCE 186, 186 (Robert M. Goodman ed., 2004).

trialized countries.[165] Hybrid corn, perhaps the most commercially valuable crop produced by this technique, begins with the development of two inbred lines "by self-pollination and selection until [each] line is relatively homozygous."[166] The use of pollen from the male inbred line to fertilize silks on the female inbred line then yields hybrid seed.[167]

Despite all precautions, each bag of hybrid seeds contains a small amount of inbred seeds.[168] These "chasing selfs," if planted, reproduce the parent lines true-to-type. With sufficient patience and land, a competing plant breeder, a farmer, or an academic researcher can use chasing selfs to unlock the inbred parent lines of a hybrid variety of corn, sorghum, or sunflower. Planting all the seeds from a bag of hybrid seed in a configuration that puts adequate space between plants facilitates ready identification of any inadvertently included inbred plants.[169] Lacking heterosis, or hybrid vigor, inbred plants look different from the taller hybrids.[170] This strategy is admittedly constrained by the extreme scarcity of males in most bags of hybrid seed. A hybrid production field typically contains more rows of female than male plants, often by a ratio of 2:1 or even 4:1.[171] Female plants are either subjected to a male sterility systems or manually

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165 *Id.*

166 Pioneer Hi-Bred Int'l v. Holden Found. Seeds, Inc., 35 F.3d 1226, 1228 n.2 (8th Cir. 1994); *see also id.* at 1236 n.38.

167 *See id.* at 1228 n.2. *See generally* Hallauer, *supra* note 164, at 187 (describing the development and deployment of hybrid corn); A.R. Hallauer, W.A. Russell & K.R. Lamkey, *Corn Breeding, in* CORN AND CORN IMPROVEMENT 463 (G.F. Sprage & J.W. Dudley eds., 1988).

168 *See* B.B. DESAI ET AL., SEEDS HANDBOOK 136 (1997) (describing how the "genetic purity of [a] breeder's seed" can be "maintained by growing the crop in isolation and by rigorous roguing during different phases of crop growth" and "can be further enhanced by bulk selection, wherein 2000–2500 plants typical of the variety are selected, harvested, and threshed separately" so that "off-types, if any" may be discarded and the remaining "uniform seeds are bulked to constitute breeder's seed").

169 *Cf.* LAWRENCE O. COPELAND & MILLER B. MCDONALD, PRINCIPLES OF SEED SCIENCE AND TECHNOLOGY 246 (4th ed. 2001) ("A corn field planted from single-cross [hybrid] seed is impressive because the plants tend to be uniform. Plant height, ear height, tasseling, silking, and pollen shedding are uniform, giving the field good eye appeal.").

170 *See, e.g., id.* at 246; DESAI ET AL., *supra* note 168, at 548; Hallauer, *supra* note 164, at 186.

171 *See* D.N. Duvick, *Commercial Strategies for Exploitation of Heterosis, in* GENETICS AND EXPLOITATION OF HETEROSIS IN CROPS 295, 296 (James G. Coors & Shivaji Pandey eds., 1999); Metaxia Koutsika-Sotiriou, *Hybrid Seed Production in Maize, in* HETEROSIS AND HYBRID SEED PRODUCTION IN AGRONOMIC CROPS 25 (Amarjit S. Basra ed., 1999).

detasseled before pollination.[172] The male rows are removed after pollination, and only the female rows are harvested for F1 (first-generation) hybrid seed.[173] The immediate removal of the male parent line reduces the probability that the harvesting of female rows containing F1 seed will contain proprietary inbred male seeds.[174] Nevertheless, in the past decade, major commercial seed breeders have resolved several lawsuits alleging breach of intellectual property rights through use of the "chasing selfs" technique.[175]

The crucial issue presented by the research exemption is the definition of "plant breeding or other bona fide research."[176] This verbal formulation defines the extent of research activities shielded from PVPA liability. The plain language of the research exemption shields only genuine, bona fide research activities. Surreptitious acts, such as efforts to isolate chasing selfs in a bag of hybrid seed, cannot constitute "plant breeding or other bona fide research." The phrase "plant breeding" must be construed, *noscitur a sociis*, alongside "bona fide research." By virtue of "an interpretive rule as familiar outside the law as it is within, . . . words and people are known by their companions."[177] Whatever else it might be, it is hard to imagine how surrepti-

172 *See* Duvick, *supra* note 171, at 296, 303; Koutsika-Sotiriou, *supra* note 171, at 51–53.

173 *See* Koutsika-Sotiriou, *supra* note 171, at 50–51.

174 *See* A.B. Maunder, *Logistics of Seed Production and Commercialization*, *in* GENETICS AND EXPLOITATION OF HETEROSIS IN CROPS, *supra* note 171, at 313, 316.

175 *See, e.g.*, Cargill, Inc. v. Nat'l Union Fire Ins. Co., No. A03-187, 2004 WL 51671, at *2 (Minn. Ct. App. Jan. 13, 2004) (resolving an insurance dispute arising from Cargill's attempt to develop new seed corn lines through "unauthorized experimentation—such as 'chasing selfs'"); Press Release, Pioneer, Syngenta and DuPont Reach Agreement on Lawsuits (Nov. 29, 2004), *available at* http://www.pioneer.com/pioneer_news/press_release/corporate/syngenta.htm (announcing the settlement of a dispute that included allegations that Syngenta Seeds, Inc., had "inappropriately acquired Pioneer proprietary genetic material . . . through a practice known as 'chasing selfs'"); Dave Price, Cargill Reaps Bitter Harvest in Pioneer Dispute: Company Agrees to Pay $100 Million, Admits Ethical Lapses in Hybrid Seed Ops (May 17, 2000) (on file with author); Press Release, Seed Quest, Cargill and Pioneer Announce Settlement of Lawsuit (May 16, 2000), *available at* http://www.seedquest.com/News/releases/usa/Pioneer/n2682.htm (announcing the settlement of a 1998 lawsuit alleging that Cargill misappropriated corn seed from Pioneer Hi-Bred International and announcing that Cargill had agreed to cease "engag[ing] in the practice of isolating parent seed from bags of . . . hybrid seed corn—a process known as 'chasing selfs'").

176 7 U.S.C. § 2544 (2000).

177 Gutierrez v. Ada, 528 U.S. 250, 255 (2000); *see also* Gustafson v. Alloyd Co., 513 U.S. 561, 575 (1995) ("[A] word is known by the company it keeps . . . ."); Jarecki v. G. D. Searle & Co., 367 U.S. 303, 307 (1961) ("The maxim *noscitur a sociis*, . . . while not an inescapable rule, is often wisely applied where a word is capable of many meanings in order to avoid the giving of unintended breadth to the Acts of Congress.").

tious exploitation of another party's proprietary seed for the purpose of duplicating that variety could be viewed as a "good faith" activity. There is nothing "bona fide" about converting another company's proprietary plant variety. Competitors do not enjoy some sort of open-ended "breeder's exemption" entitling them to unauthorized exploitation of proprietary seed.

Other sources of law reinforce the plain meaning of the PVPA's research exemption. For example, the legislative history of the PVPA states that "any transfer of title or possession" without authority of the owner constitutes infringement.[178] "We do not believe," said the United States Court of Appeals for the Federal Circuit in 1999, "that Congress meant for" private parties "to be exempt from infringement of the PVPA . . . if they know they are participating in an illegal activity."[179] More than two decades ago, the Federal Circuit's definitive interpretation of the PVPA's crop exemption (at least as that exemption existed before 1994)[180] concluded that the crop exemption "*only* exempts sales of the protected variety from one farmer directly to another farmer accomplished without the active intervention of a third party."[181]

As a general principle of statutory interpretation, provisos and exemptions should be narrowly construed so that the principal provisions of a statute may retain the vigor that Congress intended to confer upon them.[182] Within the PVPA itself, Congress has demonstrated that it is perfectly capable of granting a blanket, unconditional exemption for an entire class of parties that might otherwise be exposed to liability for infringing rights granted under the PVPA. Section 2545 provides that "[t]ransportation or delivery by a carrier in the ordinary course of its business as a carrier, or advertising by a person in the advertising business in the ordinary course of that business, shall not constitute an infringement of the protection provided under this

178 H.R. REP. No. 91-1605, at 11 (1970); *accord* Delta & Pine Land Co. v. Sinkers Corp., 177 F.3d 1343, 1350–51 (Fed. Cir. 1999).

179 *Sinkers*, 177 F.3d at 1351.

180 *See* Plant Variety Protection Act Amendments of 1994, Pub. L. No. 103-349, §§ 14(a), 15, 108 Stat. 3136, 3144, 3145; Asgrow Seed Co. v. Winterboer, 513 U.S. 179, 184 n.2 (1995) (acknowledging the 1994 amendments and the inapplicability of the pre-1994 version of the crop exemption to sales made after the 1994 amendments).

181 Delta & Pine Land Co. v. Peoples Gin Co., 694 F.2d 1012, 1016 (5th Cir. 1983) (emphasis added); *accord Sinkers*, 177 F.3d at 1348.

182 *See, e.g.*, Comm'r v. Clark, 489 U.S. 726, 739 (1989) ("In construing provisions . . . in which a general statement of policy is qualified by an exception, we usually read the exception narrowly in order to preserve the primary operation of the provision."); Phillips, Inc. v. Walling, 324 U.S. 490, 493 (1945) (observing that exemptions from the Fair Labor Standards Act should be narrowly construed).

chapter."[183] The PVPA's broad exemption for common carriers demonstrates that Congress knows how to create categorical exemptions when it wishes to do so.[184] The interpretive maxim *expressio unius est exclusio alterius* seems especially apt.[185] The PVPA's research exemption is not absolute, but rather limited to those parties who approach the statute—and proprietary plant varieties—with clean hands. A party wishing to invoke the PVPA's research exemption must engage in bona fide research intended to yield new plant varieties.

The research exemption, in addition, should be construed *in pari materia* with the PVPA's definition of the scope of the breeder's right and its definition of infringement.[186] A plant variety certificate entitles its holder "to exclude others from selling the variety, or offering it for sale, or reproducing it, or importing it, or exporting it, or using it in producing (as distinguished from developing) a hybrid or different variety therefrom."[187] In the absence of a statutory exemption, the use of unlawfully secured samples of proprietary seed to develop a competing plant variety would violate the PVPA: "Except as otherwise provided in this subchapter, it shall be an infringement of the rights of the owner of a protected variety to . . . use the variety in producing (as distinguished from developing) a hybrid or different variety therefrom."[188] The phrase, "producing (as distinguished from developing) a hybrid or different variety therefrom," appears *in haec verba* not only in the PVPA's definition of the breeder's right but also in the statute's definition of infringement.

Hypothetically, a competitor may seek to dodge charges of PVPA infringement by arguing that it has used a protected plant variety to *develop* a hybrid or different variety rather than *produce* the protected variety.[189] Insofar as the unauthorized use of a protected variety to

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183 7 U.S.C. § 2545 (2000).

184 *See Sinkers*, 177 F.3d at 1351 & n.6.

185 *See, e.g.*, Freightliner Corp. v. Myrick, 514 U.S. 280, 288 (1995) ("'Congress' enactment of a provision defining the pre-emptive reach of a statute implies that matters beyond that reach are not pre-empted.'" (quoting Cipollone v. Liggett Group, Inc., 505 U.S. 504, 517 (1992))); Leatherman v. Tarrant County Narcotics Intelligence & Coordination Unit, 507 U.S. 163, 168 (1993); *cf.* O'Melveny & Myers v. FDIC, 512 U.S. 79, 86 (1994) ("*Inclusio unius, exclusio alterius.*").

186 For expressions of the interpretive canon counseling harmonious readings of statutes *in pari materia*, see Quackenbush v. Allstate Ins. Co., 517 U.S. 706, 711–12 (1996); United States v. Riverside Bayview Homes, Inc., 474 U.S. 121, 138 n.11 (1985).

187 7 U.S.C. § 2483(a)(1).

188 *Id.* § 2541(a)(4); *cf.* Janis & Kesan, *supra* note 26, at 751 (treating the presence of this language alongside the research exemption as "vexing").

189 *See* Roger A. McEowen, *Legal Issues Related to the Use and Ownership of Genetically Modified Organisms*, 43 WASHBURN L.J. 611, 631 n.120 (2004).

"produc[e] (as distinguished from develop[ ]) a hybrid or different variety" constitutes infringement of the breeder's exclusive rights under the PVPA,[190] the statutory exemption for bona fide research must be limited to the development of a derivative hybrid or of an altogether new variety. The legislative history of the PVPA thought it permissible to use a "protected variety as one source of germ plasm to breed a novel variety."[191] By contrast, according to the House report on the PVPA, the "use of [a] protected variety in producing the commercial class of seed of [that] variety constitutes infringement."[192] Neither the mere duplication of a true-to-type variety or the isolation of chasing selfs to duplicate a proprietary hybrid fits the PVPA's description of legally-protected, bona fide research activities. Instead, simple duplication of a proprietary plant variety represents a classic instance of PVPA infringement.

The PVPA's treatment of "essentially derived" varieties after its 1994 amendments should place a further limit on recourse to the statute's research exemption. The PVPA's definition of infringement covers "any variety that is essentially derived from a protected variety, unless the protected variety is [itself] an essentially derived variety."[193] An "essentially derived variety" is "a variety that . . . is predominantly derived from another variety . . . or from a variety that is predominantly derived from the initial variety, while retaining the expression of the essential characteristics that result from the genotype or combination of genotypes of the initial variety."[194] "[E]xcept for differences that result from the act of derivation," an essentially derived variety "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."[195] The definition of an essentially derived variety also recognizes that "[a]n essentially derived variety may be obtained by the selection of a natural or induced mutant or of a somaclonal variant, the selection of a variant individual from plants of the initial variety, backcrossing, transformation by genetic engineering, or other method."[196] This definition draws further clarification from the PVPA's requirement that all protected varieties be "distinct, in the sense that the variety is clearly distinguishable from any other variety the existence of which is publicly known or a matter of com-

190 7 U.S.C. § 2541(a)(4).
191 H.R. REP. No. 91-1605, at 11 (1970).
192 *Id.*
193 7 U.S.C. § 2541(c)(1).
194 *Id.* § 2401(a)(3)(A)(i).
195 *Id.* § 2401(a)(3)(A)(iii).
196 *Id.* § 2401(a)(3)(B).

mon knowledge at the time of the filing of the application,"[197] on the basis of "one or more identifiable morphological, physiological, or other characteristics (including any characteristics evidenced by processing or product characteristics, such as milling and baking characteristics in the case of wheat) with respect to which a difference in genealogy may contribute evidence."[198] A variety that could not satisfy the statutory threshold of distinctiveness with respect to a preexisting variety should not be construed as anything more than an essentially derived variant. Despite some concerns that "the vague definition" of essentially derived variety will invite litigation and thereby undermine the ability of "the 1994 amendments [to] limit abuse of the research exemption," the PVPA's provisions on essentially derived varieties suggest that Congress intended "to disallow breeders from free-riding on others' research investments," especially when subsequent breeders have added nothing but "slight cosmetic changes" to a protected variety.[199]

The PVPA's research exemption appears to have grown from a romantic vision of innovation. In many innovative contexts, the creative process involves numerous players, each of them freely exchanging incremental creative steps. After sufficient iterations of this game, it becomes impossible to tell where the creative process begins and ends, to distinguish inventor from infringer. When innovative acts follow each other as if they were so many pancakes in a stack, there is no coherent way to identify one side as the "inventive" one.[200] Agricultural innovation is no stranger to this idyllic image. The romance of farmers and land grant university researchers exchanging seeds for the good of agriculture is entirely consistent with the dominant academic culture on matters of intellectual property.[201] The reality is considerably different. Contemporary plant breeding is a capital-intensive enterprise, one in which seemingly modest differences in agronomic performance shift enormous amounts of market share. Though land grant universities and public agricultural research stations retain a significant role in advancing plant genetics,[202] farmers

197 *Id.* § 2402(a)(2).

198 *Id.* § 2401(b)(5).

199 McEowen, *supra* note 189, at 631 n.120.

200 *See* Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, 997 (1997). *See generally* Suzanne Scotchmer, *Standing on the Shoulders of Giants: Cumulative Research and the Patent Law*, 5 J. ECON. PERSP. 29 (1991).

201 *See generally* Farber, *supra* note 67; R. Polk Wagner, *Information Wants To Be Free: Intellectual Property and the Mythologies of Control*, 103 COLUM. L. REV. 995 (2003).

202 *See generally* PAUL W. HEISEY, C.S. SRINIVASAN & COLIN THIRTLE, PUBLIC SECTOR PLANT BREEDING IN A PRIVATIZING WORLD (2001); Gregory D. Graff et al., *The Public-*

generally do not. Congress fashioned the PVPA's research exemption out of an evident expectation that commercial plant breeders would, true to the romantic view of crop improvement, use their competitors' proprietary varieties as raw material for their own innovation. As a rule, plant breeders who have exploited chasing selfs and other techniques for reverse engineering their rivals' work have been content to make knock-offs of proprietary varieties. An excessively romantic view of the research exemption, far from encouraging an innovative renaissance in the American plant breeding industry, has the perverse effect of inhibiting research in the first place.

D. Access to PVPA-Protected Seed

Even if the PVPA's research exemption could be interpreted to authorize the unfettered use of proprietary seed in downstream breeding programs, a more practical question remains. In order to exploit the technology embedded within PVPA-protected seed, a competitor must have access to that seed. There are two potential avenues for access. First, a competing plant breeder can buy seed directly from the PVPA certificate holder or an authorized sales agent. The owner of a proprietary plant variety can obstruct this direct form of access by erecting contractual and biological barriers. A breeder may refuse to sell seed to a competitor. A breeder may also insist that all seed sold by it be planted solely for nonreproductive purposes. The lack of direct access to protected seed may push a competitor toward a different, less obvious source. The PVPA requires applicants for plant variety protection to deposit seeds or other reproductive material in a public repository designated by the United States Department of Agriculture (USDA).[203] Samples so collected, if made available to the public, would represent a source of genetic material beyond a breeder's physical control and not subject to breeder-imposed contractual limitations.

I shall now explore both channels of access, beginning with material deposited in connection with PVPA applications. The PVPA does not grant public access to this material. In like fashion, contractual limitations on PVPA-protected seed are consistent with the statute and should ordinarily be upheld.

Private Structure of Intellectual Property Ownership in Agricultural Biotechology, 21 NATURE BIOTECH. 989, 990 (2003).

203 7 U.S.C. § 2422(4).

1. Public Access to Seed Deposited in Connection with PVPA Applications

The PVPA requires that "[a]n application for a certificate recognizing plant variety rights shall contain . . . [a] declaration that a viable sample of basic seed (including any propagating material) necessary for propagation of the variety will be deposited and replenished periodically in a public repository in accordance with regulations to be established hereunder."[204] According to the USDA regulations implementing this provision, an applicant seeking a plant variety protection certificate must submit "[a]t least 2,500 seeds of the viable basic seed required to reproduce the variety, unless a waiver has been granted for good cause."[205] Although this waiver provision accommodates "instances where it is impractical or impossible for the applicant to submit a sample of viable seeds," as when phytosanitary restrictions on "the importation of seed could delay the submission of a sample until the variety would no longer be eligible for protection," the availability of a waiver "is not intended to operate so that the certificate could be obtained without submitting the seed sample."[206] These seeds must be stored in a public repository approved by the Commissioner of Plant Variety Protection for the duration of the certificate.[207]

Hypothetically speaking, these seeds are a tempting target for parties seeking to evade the contractual restrictions that are routinely imposed on commercial seed. The Supreme Court, albeit merely in passing, has declared that the public has no right to seeds deposited in connection with applications for plant variety protection, at least during any applicable term of protection. *J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred International, Inc.*[208] observed that the PVPA "requires a deposit of seed in a public depository . . . but neither the statute nor the applicable regulation mandates that such material be accessible to the general public during the term of the PVP certificate."[209] Closer examination of the sources of law underlying this issue confirms the validity of *J.E.M. Ag Supply*'s dictum: throughout the duration of a PVPA certificate, seeds deposited in connection with an application

204 *Id.*

205 7 C.F.R. § 97.6(d)(1) (2005), *amended by* Supplemental Fees, 70 Fed. Reg. 28,783 (Plant Variety Prot. Office May 19, 2005).

206 70 Fed. Reg. at 28,785.

207 7 C.F.R. § 97.6(d)(1).

208 534 U.S. 124 (2001).

209 *Id.* at 143.

for that certificate should not be released by the repository for public use without the applicant's consent.

The National Seed Storage Laboratory (NSSL) in Ft. Collins, Colorado, is the sort of public repository for seeds protected that the PVPA contemplates. The NSSL is the crown jewel in the United States' "diffuse network of laboratories and research stations" designed to preserve the country's grip on plant genetic diversity.[210] Upon the expansion of the PVPA in 1994 to cover tuber-propagated varieties and first-generation hybrids,[211] the USDA made arrangements to secure reproductive material for these varieties. In connection with an "application for a tuber propagated variety," the Commissioner of Plant Variety Protection demands "a declaration that a viable cell culture will be deposited in a public depository approved by the Commissioner and will be maintained for the duration of the certificate."[212] This requirement is congruent with the statutory definition of "[t]he term 'seed', [sic] with respect to a tuber propagated variety, [as] the tuber or the part of the tuber used for propagation."[213] With respect to "a hybrid from self-incompatible parents," the Commissioner seeks "a declaration that a plot of vegetative material for each parent will be established in a public depository approved by the Commissioner and will be maintained for the duration of the certificate."[214]

These formal PVPA regulations do not prescribe a specific procedure governing seeds for true-to-type crops such as wheat, soybeans, and cotton. Determining the legal treatment of this important category of plant genetic material demands inspection of the Department of Agriculture's inner workings. The PVPA establishes the Plant Variety Protection Office (PVPO) as a subdivision of the USDA.[215] According to the PVPA, the PVPO "shall devote itself substantially exclusively to the administration of this chapter."[216] USDA regulations and informal pronouncements by the PVPO bear heavily on the

210 *See* NAT'L RESEARCH COUNCIL, MANAGING GLOBAL GENETIC RESOURCES: THE U.S. NATIONAL PLANT GERMPLASM SYSTEM 1 (1991) (describing the National Seed Storage Laboratory as one of the Department of Agriculture's most important tools for preserving germplasm diversity).

211 *See* Plant Variety Protection Act Amendments of 1994, Pub. L. No. 103-349, § 3, 108 Stat. 3136, 3138–39 (amending 7 U.S.C. § 2402).

212 7 C.F.R. § 97.6(d)(2), *amended by* Supplemental Fees, 70 Fed. Reg. 28,783 (Plant Variety Prot. Office May 19, 2005).

213 7 U.S.C. § 2401(a)(5).

214 7 C.F.R. § 97.6(d)(3), *amended by* 70 Fed. Reg. 28,783.

215 7 U.S.C. § 2323 (providing that the organization of the PVPO "shall, except as provided herein, be determined by the Secretary of Agriculture").

216 *Id.*

interpretation of the PVPA's requirement that applicants for plant variety protection deposit reproductive material in a public repository.

Through its website and other casual publications, the PVPO sometimes renders informal interpretations of the PVPA. The "Frequently Asked Questions" section of the PVPO's website outlines the agency's approach to seeds for true-to-type crops:

> A small sample (less than 25 seeds) may be kept by the examiner to assist in the examination process. This sample is destroyed once examination is complete and the sample is no longer needed.

The bulk of the seed sample serves as a voucher specimen, for PVPO's use should a question ever arise about the validity of the description. The sample is sent to the National Seed Storage Laboratory in Ft. Collins, Colorado. The memorandum of understanding between PVPO and NSSL states that these seed samples will be kept separate from their general collection during the term of PVPO protection. When received by NSSL, their staff count the seeds in the sample and test it for germination rate. If the sample is too small in size or too low in germination, they report that to the PVP Office. PVPO then requests seed replenishment. (This process is repeated periodically during the examination and protection periods. Therefore, we always need to know how to contact the applicant (or owner) in case a seed replenishment is needed.) The seed sample is then placed in long-term storage, according to practices established by NSSL.[217]

The PVPO's website also makes it clear that seeds deposited in a public depository are not accessible to the public as long as those seeds are protected by a plant variety certificate:

> While the application [for a plant variety protection certificate] is being processed and continuing through the term of protection (20–25 years), only the PVPO has access to the seed sample. We would only need access when a question arises about the validity or accurracy [sic] of the variety description. If the application is ineligible or denied, or if it is abandoned or withdrawn by the applicant, then the seed sample is destroyed or returned to the applicant and again is not available to others. When an issued certificate expires (for any reason), then the seed sample is transferred to NSSL's general collection and can be requested by others.[218]

Informal statements by the PVPO provide persuasive (albeit not conclusive or binding) evidence of the meaning of the PVPA. The

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217 Plant Variety Protection Office—FAQ (Seed Sample), http://www.ams.usda.gov/science/pvpo/FAQ/seedsamples.htm#others (last visited Oct. 3, 2005).

218 *Id.*

PVPO's online answers to "Frequently Asked Questions" do not rest on any specific statutory authorization or result from a legally rigorous rulemaking process. The PVPA merely authorizes the Secretary of Agriculture to "establish regulations, not inconsistent with law, for the conduct of proceedings in the Plant Variety Protection Office after consultations with the Plant Variety Protection Board."[219] This authorization cannot be plausibly interpreted as exempting USDA from compliance with the Administrative Procedure Act's (APA) provisions governing notice-and-comment rulemaking. The PVPO's informal exercises in statutory interpretation simply do not comply with the APA's procedures formal adjudication or notice-and-comment rulemaking. In the 2000 case of *Christensen v. Harris County*,[220] the Supreme Court observed that interpretions *not* "arrived at after, for example, a formal adjudication or notice-and-comment rulemaking"[221] do not warrant the broad judicial deference otherwise prescribed by *Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc.*[222] "Interpretations such as those in opinion letters—like interpretations contained in policy statements, agency manuals, and enforcement guidelines, all of which lack the force of law—do not warrant [broad judicial] deference."[223] Nevertheless, "given the specialized experience and broader information available to . . . an agency, these informal interpretations are 'entitled to respect' to the extent that they have the 'power to persuade.'"[224] Therefore, informal interpretations of the PVPA "may merit some deference whatever their form, given the 'specialized experience and broader investigations and information' available to" the PVPO and the USDA at large "and given the value of uniformity in its administrative and judicial understandings of what a national law requires."[225]

The assumption that members of the public may obtain access to protected seed on deposit has no support in the PVPA, the statute's implementing regulations, or any other source of law. USDA regulations do provide that an applicant for a plant variety protection certifi-

219 7 U.S.C. § 2326.

220 529 U.S. 576 (2000).

221 *Id.* at 587.

222 *Id.* (citing Chevron U.S.A. Inc. v. Natural Res. Def. Council, Inc., 467 U.S. 837 (1984)); *see also* Am. Fed'n of Gov't Employees v. Rumsfeld, 262 F.3d 649, 656 (7th Cir. 2001) ("[W]hen the statute is silent or ambiguous with respect to an issue before the court, the court should defer to the agency's interpretation so long as it is based on a permissible construction of the statute.").

223 *Christensen*, 529 U.S. at 587.

224 *Am. Fed'n*, 262 F.3d at 656 (quoting *Christensen*, 529 U.S. at 587).

225 United States v. Mead Corp., 533 U.S. 218, 234 (2001) (quoting Skidmore v. Swift & Co., 323 U.S. 134, 139 (1944)); *accord, e.g.*, Old Ben Coal Co. v. Office of Workers' Comp. Programs, 292 F.3d 533, 542 (7th Cir. 2002).

cate may be "required by the examiner to furnish representative specimens of the variety, or its flower, fruit, or seeds, in a quantity and at a specified stage of growth," but only "as may be necessary to verify the statements in the application."[226] Neither the USDA nor any other legal authority suggests that deposits of protected reproductive material at the NSSL may be made available to the USDA, let alone to the general public, for any other purpose. Indeed, the PVPA's implementing regulations clearly and pointedly provide that "[p]lant specimens submitted in support of an application shall not be removed from the [Plant Variety Protection] Office except by an employee of the Office or other person authorized by the Secretary."[227] Once all plant specimens submitted to the PVPO "have served their intended purpose," the regulations allow an applicant to request that those materials be "returned . . . at his or her expense."[228] Only "upon a finding of good cause" may the "Commissioner . . . require that certain specimens be retained in the Office for indefinite periods of time."[229] Otherwise, "[s]pecimens which are not returned or not retained as provided above shall be destroyed."[230] Read as a whole, these regulations strongly suggest that seed deposits are to be used solely by the government and strictly for the purpose of determining the merits of an application for plant variety protection.

To be sure, there is some tension between the PVPA's implementing regulations and the "Frequently Asked Questions" section of the PVPO's website. According to the PVPO's website, a deposited seed sample does become available to the public once "an issued certificate expires (for any reason)."[231] Upon the expiration of a certificate, the previously protected "seed sample is transferred to NSSL's general collection and can be requested by others."[232] The constitutional interest in eventual transfer of federally-protected intellectual property to the public domain may dictate public access to PVPA-protected plant material upon the expiration of a plant variety certificate. Seeds and tubers, of their own accord, represent the enabling disclosure that plant breeders must make in order to qualify for rights conferred under the authority of the Constitution's Intellectual Property Clause. Deposited reproductive material, once made available to the public, communicates the technical information that would enable the even-

226 7 C.F.R. § 97.8(a) (2005).
227 *Id.* § 97.8(b).
228 *Id.* § 97.8(c).
229 *Id.*
230 *Id.*
231 Plant Variety Protection Office—FAQ (Seed Sample), *supra* note 217.
232 *Id.*

tual duplication of each plant breeder's efforts. That disclosure in turn represents "the *quid pro quo*" demanded by the public in exchange for "the right to exclude," the implicit social payment for intellectual property protection over a limited term.[233]

From a competing breeder's point of view, however, the real prize is access to deposited seeds *before* the expiration of a plant variety certificate. There simply is no legal basis for this purported right. Neither the USDA's PVPA regulations nor their preamble hints that the public might have access to deposited seed before the expiration of a PVPA certificate. At most, the USDA has remarked that "the requirement that the application must be accompanied by a seed sample" has been revised so that an application for protection of "a tuber propagated variety . . . [will] be accompanied by 'verification that a viable cell culture will be deposited in a public depository before the issuance of the certificate and will be maintained for the duration of the certificate.'"[234] At the same time, the USDA has acknowledged, with respect to sexually reproduced plants, that "seed samples provide information on seed characteristics and demonstrate the uniformity of the deposit," insofar as "[n]o such information is gained from a cell culture."[235] The legislative history of the PVPA makes it clear that the deposit requirement is intended to preserve the viability of the variety.[236]

Even if the requirement to deposit seeds in connection with an application for a plant variety protection certificate could somehow be construed as entitling members of the public to receive free access to deposited seeds, sound principles of statutory interpretation counsel strongly against this reading of the PVPA and its implementing regulations. When government compels the submission of proprietary data otherwise protected by state trade secret laws, compulsory disclosure

233 Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 484 (1974) (describing this arrangement as the essential social bargain embodied in the patent laws); *accord* J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc., 534 U.S. 124, 142 (2001).

234 Plant Variety Protection Regulations, 60 Fed. Reg. 17,188, 17,188 (Apr. 4, 1995), *amended by* Supplemental Fees, 70 Fed. Reg. 28,783 (Plant Variety Prot. Office May 19, 2005); *see also* 70 Fed. Reg. at 28,785 (amending 7 C.F.R. § 97.6(d)) ("Because of the expense of depositing cell cultures and *because cell cultures are not useful in the examination process*, the PVP Office has granted exceptions to applicants so that the cell culture need not be deposited until the examination has been completed." (emphasis added)).

235 60 Fed. Reg. at 17,188.

236 *See Plant Variety Protection Act Amendments: Hearings on H.R. 99 Before the Subcomm. on Department Investigations, Oversight, and Research of the H. Comm. on Agriculture*, 96th Cong. 83 (1980) (statement of Bernard M. Leese, Jr., Comm'r, Plant Variety Protection, Agricultural Marketing Service); Janis & Kesan, *supra* note 26, at 748.

of the information at issue to other parties destroys the owner's valued interest in retaining his or her "right to exclude others."[237] In light of the Fifth Amendment's promise that "private property" shall not "be taken for public use, without just compensation," the USDA should not demand the delivery of seed samples to the NSSL as a condition of plant variety protection with the intent of granting public access to those seeds, especially for reproductive purposes.[238]

An aggrieved party would not necessarily have to establish that interpreting the PVPA to compel public access to deposited seed would actually violate the Constitution. What matters is that such an interpretation would raise serious constitutional doubts.[239] Given the choice, a court should construe the PVPA and its implementing regulations not to permit public access to deposited, proprietary seed during the term of statutory protection. The avowed purpose of the PVPA is to "afford adequate encouragement for research . . . to yield for the public the benefits of new varieties."[240] The presence of this statutory aspiration makes it extraordinary to construe the PVPA and its implementing regulations so that the public could freely acquire samples of proprietary seed deposited at the NSSL in connection with an application for plant variety protection.

Indeed, the presumptive unavailability of deposited seeds represents one respect in which the PVPA appears to grant more generous protection to plant breeders than would be available through a utility patent. Whereas the regulations implementing the patent laws permit

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237 Ruckelshaus v. Monsanto Co., 467 U.S. 986, 1011 (1984) (recognizing a property right in trade secret data submitted to the Environmental Protection Agency in connection with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)); *see also* Thomas v. Union Carbide Agric. Prods. Co., 473 U.S. 568, 571 (1985) (validating a scheme for compensating the owners of trade secrets that are used by follow-on applicants under FIFRA).

238 U.S. CONST. amend. V; *cf.* Nollan v. Cal. Coastal Comm'n, 483 U.S. 825 (1987) (holding that a state zoning commission could not, without paying compensation, condition the grant of permission to rebuild a house on beachfront property upon the owner's cession of a public easement across that property).

239 *See, e.g.*, Edward J. DeBartolo Corp. v. Fla. Gulf Coast Bldg. & Constr. Trades Council, 485 U.S. 568, 575 (1988) (holding that the NLRB's construction of the National Labor Relations Act was not entitled to deference to the extent that its interpretation posed a serious question of the provision's validity under the First Amendment); NLRB v. Catholic Bishop of Chi., 440 U.S. 490, 500–01 (1979) (finding "serious constitutional questions" concerning the exercise of NLRB jurisdiction over a church-affiliated school); *cf.* Ashwander v. TVA, 297 U.S. 288, 348 (1936) (Brandeis, J., concurring) (counseling reliance on nonconstitutional bases for rendering a decision, whenever available, over constitutional approaches to adjudication).

240 7 U.S.C. § 2581 (2000).

public access to samples of patented biological material,[241] neither the PVPA nor its regulations appear to contemplate access of this sort. Although the PVPA "requires a deposit of seed in a public depository, . . . neither the statute nor the applicable regulation mandates that such material be accessible to the general public during the term of the PVP certificate."[242] Statutory and regulatory silence seems dispositive. The presumptive unavailability of proprietary seed deposits at the NSSL throughout the term of protection represents one of those instances in which "the fact that the dog did not bark can itself be [legally] significant."[243]

At a certain level, it may seem tempting to construe the PVPA and the Patent Act *in pari materia* with respect to the issue of public access to biological material deposited in connection with an application for proprietary protection. Against the backdrop of the Patent Act's well established approach of permitting access, the silent PVPA arguably should be interpreted to permit a similar degree of access. This superficially appealing argument ignores fundamental differences between the PVPA and the Patent Act. The Patent Act demands an extensive disclosure from any patent applicant and delivers comprehensive protection to those applicants who successfully secure a patent. By contrast, the PVPA requests much less information from its applicants. Samples of biological material do not merely verify a PVPA application; in a very meaningful sense, they affirmatively represent the plant breeder's disclosure of its invention. Possession of protected samples enables any person trained in the art to duplicate and capture a plant breeder's innovation. Releasing those samples before the expiration of a PVPA certificate would seriously undermine the holder's proprietary interest without delivering a corresponding increase in the public's scientific understanding.

Differences in the two statutes' enforcement mechanisms are also dispositive. Downstream infringement of patent rights in biological material can be swiftly and thoroughly punished. The presence of a patented plant's telltale DNA in seed sold by a competing breeder or

241 *See* Monsanto Co. v. Swann, 308 F. Supp. 2d 937, 940 (E.D. Mo. 2003); 37 C.F.R. § 1.801–.809 (2005).

242 J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc., 534 U.S. 124, 143 (2001) (citing 7 C.F.R. § 97.6 (2001)).

243 Griffin v. Oceanic Contractors, Inc., 458 U.S. 564, 589 (1982) (Stevens, J., dissenting); *accord* Chisom v. Roemer, 501 U.S. 380, 396 n.23 (1991); *see also* Harrison v. PPG Indus., Inc., 446 U.S. 578, 602 (1980) (Rehnquist, J., dissenting) ("In a case where the construction of legislative language such as this makes so sweeping and so relatively unorthodox a change as that made here, I think judges as well as detectives may take into consideration the fact that a watchdog did not bark in the night.").

within seed hoarded or peddled by a farmer provides fairly stark evidence of infringement. For instance, in a case involving alleged infringement of three patents on Monsanto's Roundup Ready® and Bollgard® pesticide-resistance technology, the application of "three separate testing procedures on the [disputed] cotton and soybean crops" exposed the presence of the "patented gene technology in 93% of the cotton samples and 100% of the soybean samples."[244] Coupled with the defendant's admitted failure ever to sign a licensing agreement covering Monsanto's Roundup Ready® and Bollgard® patents, these tests pointed unequivocally to an instance of patent infringement: "The only conclusion to be drawn from the results of the testing is that Defendant was clearly using Plaintiff's patented technology in his cotton and soybean crops for the 2000 season. . . . Therefore, Defendant infringed on Plaintiff's patent by using its patented technology without authorization."[245]

Although DNA testing can also identify PVPA-protected plants, that statute's research and crop exemptions cloud the clarity of the legal conclusion that can be drawn from the presence of a proprietary DNA signature. Unlike the Patent Act, the PVPA privileges certain uses of proprietary plant varieties by a certificate holder's customers and business rivals, the very parties who are likeliest to violate the statute. The differences between these statutes suggest a general rule regarding the relationship between the strength of an intellectual property scheme and the government's degree of discretion in permitting public access to proprietary technology during the term of protection. More robust protection of intellectual property enables

244 Monsanto Co. v. Trantham, 156 F. Supp. 2d 855, 859 (W.D. Tenn. 2001). The court detailed the technology by which Monsanto tested the disputed seeds:

> The [cotton and soybean] samples were . . . transferred for testing to Denise Breimeir at Biolab Solutions. At Biolab, Ms. Breimeir subjected 75 samples of Defendant's cotton plant leaves to assay by enzyme link immunosorbent assay ("ELISA") to detect the presence of CRY1A(c) protein produced by Bollgard® Cotton. The ELISA testing showed that 93% of the cotton samples produced the CRY1A(c) protein. Dr. Pang then tested 17 cottonseeds from bolls of cotton taken from Defendant's land by extracting the DNA from the seeds and using a polymerase chain reaction method ("PCR") to determine whether the transgene insertion region for the Bollgard® gene was present in the cottonseeds. In addition, the seeds were assayed for the presence of tandemly duplicated CaMV35S enhancer sequence. Finally, the PCR products from the PCR testing were subjected to restriction endonuclease analysis which demonstrated that the CaMV35S enhancer sequence that expresses the CRY1A(c) protein was present in the seeds.

Id. at 868.

245 *Id.*

the government to permit greater access to biological samples and other materials that have the potential to foster infringement, especially before the rights in question expire.

2. Contractual Restrictions on the Use of PVPA-Protected Seed

Plant breeders routinely require purchasers of PVPA-protected seed to waive their statutory rights under the PVPA's crop and research exemptions through "seed-wrap" or "bag-tag" licenses printed on or attached to a bag of seed.[246] This is an instance of using contract as a means of privately securing rights akin to those ordinarily conferred through intellectual property legislation or, as may be true in the context of PVPA-protected seed, restoring the breeder's control over plant genetic information.[247] Seed-wrap licenses routinely prohibit the "[r]esale of . . . seed or supply of saved seed to anyone, including [the] [p]urchaser, for planting"; the "[u]se of [the] product, or the parental lines used in producing [the] product, for use in development or breeding"; and the use of "any parental seed that might be unintentionally contained . . . for purposes . . . [other than] produc[tion of] forage, or grain for feeding or processing."[248] These provisions, if valid, would effectively strip a purchaser of PVPA-protected seed of rights shielded under the statute's crop and research exemptions.

Dan L. Burk has suggested that the PVPA's research and crop exemptions "might abrogate seed-wrap terms that would frustrate the intent of such statutory provisions."[249] Professor Burk's suggestion, admittedly made in passing and without extensive analysis, does not withstand close legal scrutiny. Plant breeders may impose seed-wrap contracts even in the absence of plant variety protection; "[i]t is possible to establish these license agreements based on trade secret or util-

246 *See* Burk, *supra* note 15, at 1557–58; Neil D. Hamilton, *Legal Issues Shaping Society's Acceptance of Biotechnology and Genetically Modified Organisms*, 6 DRAKE J. AGRIC. L. 81 (2001); Neil D. Hamilton, *Why Own the Farm If You Can Own the Farmer (and the Crop)?: Contract Production and Intellectual Protection of Grain Crops*, 73 NEB. L. REV. 48, 90–92 (1994).

247 *See* J.H. Reichman & Jonathan A. Franklin, *Privately Legislated Intellectual Property Rights: Reconciling Freedom of Contract with Public Good Uses of Information*, 147 U. PA. L. REV. 875 (1999).

248 Janis & Kesan, *supra* note 26, at 772 (quoting a "representative example of the key licensing restrictions in a bag-tag license"); *see also* Pioneer Hi-Bred Int'l, Inc. v. Ottawa Plant Food, Inc., 283 F. Supp. 2d 1018, 1045–46 (N.D. Iowa 2003) (quoting similar language).

249 Burk, *supra* note 15, at 1569.

ity patent protection for the plant varieties" at issue.[250] The scope of protection available under the PVPA falls roughly between the protective levels of trade secret and patent. If seed-wrap contracts are valid when based on trade secret or patent, they should be valid *a fortiori* when the underlying genetic information is protected under the PVPA.

The baseline established by trade secret law is especially revealing, since the validity of seed-wrap contracts that shield this weaker form of intellectual property should provide a safe harbor for seed-wrap licensing under the PVPA. "[G]enetic messages" such as those coded within high-yielding or pesticide-resistant seeds have been presumed suitable "for trade secret status."[251] The threshold for qualifying for protection under trade secret law is putatively lower than that of the PVPA and certainly lower than that of patent law. Trade secret law's requirement of secrecy need not meet patent law's requirement of "novelty" or an "inventive step";[252] even where no patent could issue, trade secret protection may be available.[253] Most significantly, the law of trade secrets offers no protection against reverse engineering. "A trade secret law," generally speaking, "does not offer protection against discovery by fair and honest means."[254] Later innovators may freely exploit "independent invention, accidental disclosure, or . . . so-called reverse engineering, that is by starting with the known product and working backward to divine the process which aided in its development or manufacture."[255]

In the abstract, the exploitation of chasing selfs to isolate the inbred parent lines of a hybrid variety may constitute either an instance of permitted reverse engineering or an infringement of a trade secret. If the use of chasing selfs "is deemed to be an act of uncovering the trade secret through legitimate, publicly available means, it may fit

250 Janis & Kesan, *supra* note 26, at 773.

251 Pioneer Hi-Bred Int'l Inc. v. Holden Found. Seeds, Inc., 35 F.3d 1226, 1235 (8th Cir. 1994) ("assum[ing] without deciding" this legal proposition); *see also* Jeffrey J. Wolf, Note, *The "Genetic Message" from the Cornfields of Iowa: Expanding the Law of Trade Secrets*, 38 DRAKE L. REV. 631 (1988–1989).

252 *See* W.R. Grace & Co. v. Hargadine, 392 F.2d 9, 14 (6th Cir. 1968); *cf.* Doris Estelle Long, *The Impact of Foreign Investment on Indigenous Culture: An Intellectual Property Perspective*, 23 N.C. J. INT'L L. & COM. REG. 229, 277 (1998) (arguing that folk knowledge rarely exhibits the sort of inventive step that patent law demands).

253 *See* Aronson v. Quick Point Pencil Co., 440 U.S. 257, 265–66 (1979).

254 Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 476 (1974).

255 *Id. See generally* Pamela Samuelson & Suzanne Scotchmer, *The Law and Economics of Reverse Engineering*, 111 YALE L.J. 1575 (2002).

within the scope of permissible reverse engineering."[256] On the other hand, if this technique "is characterized as taking advantage of a mistaken or accidental disclosure of the secret, where all reasonable precautions against disclosure were taken, then trade secret protection might be preserved."[257] A prominent federal appellate decision appears to have resolved this issue in favor of trade secret holders. In *Pioneer Hi-Bred International v. Holden Foundation Seeds, Inc.*,[258] a 1994 decision that is probably the leading case on trade secret protection of hybrid seed, the United States Court of Appeals for the Eighth Circuit concluded that "efforts [to] search[ ] 'friendly farms' for stray inbred plants" constituted the sort of misappropriation that supported a meritorious trade secret claim.[259] By this baseline, the violation of contractual terms explicitly barring a seed purchaser from using seed for downstream breeding should readily support a trade secret claim.

In casting doubt on the validity of seed-wrap contracts that force waiver of the PVPA's crop and research exemptions, Professor Burk relies heavily on an analogy to the patent misuse doctrine.[260] The patent misuse doctrine is designed "to prevent a patentee from using [a] patent to obtain market benefit beyond that which inheres in the statutory patent right."[261] For instance, patent law forbids "bald attempt[s]" to extend the exclusivity period of a patent through contracts purporting "to exact the same terms and conditions" as the statutory grant.[262] The problem with Professor Burk's suggestion is that it flies squarely in the face of the Federal Circuit's definitive resolution of the issue. In a pair of cases, both styled *Monsanto Co. v. McFarling*,[263] the Federal Circuit ruled against a farmer who had saved patented Roundup Ready® soybean seed and planted it in a subsequent growing season in violation of Monsanto's licensing agreement.

256 Mark D. Janis, *Intellectual Property Issues in Plant Breeding and Plant Biotechnology*, *in* BIOTECHNOLOGY, GENE FLOW, AND INTELLECTUAL PROPERTY RIGHTS 1, 7 (Marshall A. Martin ed., 2002).

257 *Id.*

258 35 F.3d 1226 (8th Cir. 1994).

259 *Id.* at 1239.

260 *See* Burk, *supra* note 15, at 1569.

261 Mallinckrodt, Inc. v. Medipart, Inc., 976 F.2d 700, 704 (Fed. Cir. 1992); *accord* Carbice Corp. of Am. v. Am. Patents Dev. Corp., 283 U.S. 27, 30–31 (1931); Senza-Gel Corp. v. Seiffhart, 803 F.2d 661, 665 (Fed. Cir. 1986).

262 Brulotte v. Thys Co., 379 U.S. 29, 32 (1964) (declaring contracts of this sort "unlawful *per se*").

263 363 F.3d 1336 (Fed. Cir. 2004) (*McFarling II*), *cert. denied*, 73 U.S.L.W. 3075 (U.S. June 27, 2005) (No. 04-31); 302 F.3d 1291 (Fed. Cir. 2002) (*McFarling I*), *cert. denied*, 537 U.S. 1232 (2003).

In the 2002 case of *McFarling I*, Homan McFarling, a Mississippi soybean farmer, attacked the licensing agreement as "an illegal tying arrangement" that "requir[ed] farmers to buy new Roundup Ready® seed each year instead of allowing them to produce their own Roundup Ready® seed from the prior year's crop."[264] No tying arrangement existed, the Federal Circuit held, insofar as the licensing agreement did not "prevent[ ] Mr. McFarling from switching to other soybean seeds" among the "over two hundred commercial sources of soybean seed, including several herbicide-resistant soybeans."[265] As a federal district court applying *McFarland I* characterized this holding, farmers who purchase patented seed subject to a licensing agreement prohibiting the replanting of saved seed "are not in the position of [a] new-car purchaser obliged to purchase a new car every year."[266] "Rather," such farmers "are in the position of a car-lessor crying foul upon discovering he cannot retain the car after his lease expires."[267] Nor did the licensing agreement violate patent law's "first sale" doctrine[268] insofar as McFarling never sold "the new seeds grown from the original batch" of Roundup Ready® soybeans.[269] In a very similar contemporaneous dispute, a federal district court squarely held in 2001 that a single-use licensing agreement falls "within the scope of [a] patent grant" on herbicide resistance technology and that patent law's "doctrine of exhaustion does not bar [a] suit for infringement [where] the sale of . . . patented gene technology is expressly conditioned on the signing of [a] restrictive licensing agreement that prohibits the saving of seed and restricts the use of the seed to a single growing season."[270] Perhaps most devastatingly, *McFarling I* flatly rejected the argument that the PVPA's crop exemption, "which permits farmers to save seeds of plants registered under" that statute, vitiates "contractual prohibition[s] against using . . . patented seed to produce new seed for planting."[271] The Federal Circuit held "that the right to save seed . . . under the PVPA does not impart the right to save seed . . . under the Patent Act."[272]

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264 *McFarling I*, 302 F.3d at 1297.

265 *Id.* at 1298.

266 Monsanto Co. v. Swann, 308 F. Supp. 2d 937, 942 (E.D. Mo. 2003).

267 *Id.*

268 *See generally* United States v. Univis Lens Co., 316 U.S. 241 (1942).

269 *McFarling I*, 302 F.3d at 1299.

270 Monsanto Co. v. Trantham, 156 F. Supp. 2d 855, 870 (W.D. Tenn. 2001).

271 *McFarling I*, 302 F.3d at 1299.

272 *Id.*; *see also McFarling II*, 363 F.3d 1336, 1344 (Fed. Cir. 2004), *cert. denied*, 73 U.S.L.W. 3075 (U.S. June 27, 2005) (No. 04-31) ("Congress did not intend to prohibit owners of utility patents from enforcing seed-saving prohibitions in their licenses.").

Decided in 2004, *McFarling II* elaborated McFarling's charge of patent misuse through unlawful tying. Reformulating his tying claim as one "center[ed] on his desire to replant the entire seed" derived from the original bag of Roundup Ready® soybeans "and on Monsanto's refusal to grant him permission to do so," McFarling proposed a remedy that would allow farmers to "save and replant ROUNDUP READY® seed each year" upon payment of a technology fee in lieu of the existing arrangement by which farmers "purchase both the seed and the genetic technology together at the beginning of each growing season."[273] This argument, if credited, would establish "a compulsory license to use the patent rights in conjunction with . . . second-generation ROUNDUP READY® soybeans."[274] *McFarling II* "decline[d] to hold that Monsanto's raw exercise of its right to exclude from the patented invention by itself [was] an impermissible "'tying' arrangement that exceeds the scope of the patent grant."[275] Although the court stopped short of holding that the licensing agreement imposed "permissible field-of-use restrictions on the first-generation seeds,"[276] it did sustain the saved seed prohibition on the reasoning that Monsanto's Roundup Ready® patent would embrace "all generations of soybeans produced."[277] Any restriction "prohibiting the replanting of" any subsequent "generation of ROUNDUP READY® soybeans" would accordingly "not extend Monsanto's rights under the patent statute."[278]

The *McFarling* decisions leave just enough room for one last-ditch argument. Opponents of seed-wrap licensing might argue that the PVPA should preempt contractual limitations purporting to strip purchasers of PVPA-protected seed of their rights under that statute's crop and research exemptions.[279] The Patent Act, after all, does not privilege the saving of seed or its use in developing (as distinguished from producing) new plant varieties. Seed-wrap contracts on patented seed deprive purchasers of no privilege they would have enjoyed under the Patent Act. The almost certain validity of seed-wrap

273 *McFarling II*, 363 F.3d at 1342.

274 *Id.*; *see also id.* at 1344 ("McFarling is not alleging that he is unable to, or even that he desires to, purchase a 'natural' soybean seed and the ROUNDUP READY® genetic trait as distinct items; he alleges only that Monsanto refuses to grant him a license to use . . . second-generation . . . seeds . . . in his preferred manner.").

275 *Id.* at 1342.

276 *Id.*

277 *Id.* at 1343.

278 *Id.*

279 *See* Burk, *supra* note 15, at 1570–71; *cf.* McEowen, *supra* note 189, at 644 n.196 (suggesting that "the antitrust arguments made by the farmer[ ] in . . . *McFarling* were not fully developed").

contracts on plant varieties protected solely under trade secret law, however, undermines this argument. Trade secret law typically entitles competitors to engage in the very sort of reverse engineering that often represents the first step in PVPA infringement (especially when competitors use the chasing selfs technique to expose a hybrid variety's inbred parent lines). At least in Iowa and in any other state with a comparable approach to trade secrets, the Eighth Circuit's *Holden* decision leaves little doubt that a seed-wrap license would strip this right to experiment from a purchaser of seed protected solely under the law of trade secrets. Interpreting the PVPA in a way inconsistent with *Holden* and *McFarling* would merely encourage plant breeders either to seek patents rather than PVPA certificates or, far worse, to forgo both federal systems of protection in favor of trade secret law. Because the law of trade secrets, by design, keeps information concealed, it represents an exceptionally poor vehicle for delivering information of any sort into the public domain. Interpreting a law enacted under Congress's authority to "secur[e] for limited Times . . . the exclusive Right to . . . Writings and Discoveries" in such a debilitating way that "Authors and Inventors" have a greater incentive to keep their innovations secret represents a profound perversion of the constitutional command to "promote the Progress of Science and useful Arts."[280]

THE PARABLE OF THE SOWER

"For every constitution there is an epic, for each decalogue a scripture."[281] The story of the American republic is in essence an agrarian epic. In a nation that "was born in the country and has moved to the city,"[282] the well worn "path from barnyard to suburb" has become "the dominant [historical] narrative."[283] This country is everything from "the slice of a continent" to "a group of holding companies, some aggregations of trade unions, a set of laws bound in calf, a radio network, a chain of moving picture theatres."[284] "But mostly U. S. A. is the speech of the people."[285] The idiom by which the American people "know in part, and . . . prophesy in part"[286] assuredly takes its rhythm and cadence from the "vast obscurity" beyond

280 U.S. CONST. art. I, § 8, cl. 8.

281 Robert Cover, *The Supreme Court, 1982 Term—Foreword:* Nomos *and Narrative,* 97 HARV. L. REV. 4, 4 (1983).

282 RICHARD HOFSTADTER, THE AGE OF REFORM: BRYAN TO FDR 23 (1955).

283 Jim Chen, Filburn*'s Legacy,* 52 EMORY L.J. 1719, 1767 (2003).

284 JOHN DOS PASSOS, U.S.A. 2 (Library of America 1996) (1937).

285 *Id.* at 3.

286 I *Corinthians* 13:9 (King James Version).

America's cities and "the dark fields of the republic roll[ing] on under the night."[287]

Within the grand narrative of American law and history, agriculture has played a prominent role. The USDA—which remains this nation's only Cabinet-level office dedicated to the welfare of a specific industry—was originally commissioned "to acquire and to diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of that word, and to procure, propagate, and distribute among the people new and valuable seeds and plants."[288] Plant variety protection represents a crucial component of this agenda. The PVPA should be interpreted so as not to destroy that statute's overarching purpose, that of "afford[ing] adequate encouragement for research . . . to yield for the public the benefits of new varieties."[289] Only through the imposition of legally meaningful limits, both on access to reproductive material deposited in connection with applications for plant variety protection and on the PVPA's statutory exemptions, can the interpretation and application of this law be kept from "undercut[ting] . . . the PVPA's incentives" for innovation by plant breeders.[290]

As matters stand, the PVPA appears to have provided at most modest incentives for private investment in agricultural research and development.[291] Nor does the PVPA appear to have generated significant improvements in crop quality, crop yields, or any other measure of agronomic performance.[292] Thanks to the astounding scope of the PVPA's crop exemption before 1994, withering competition from

287 F. SCOTT FITZGERALD, THE GREAT GATSBY 141 (Matthew J. Bruccoli ed., Cambridge Univ. Press 1991) (1925).

288 Act of May 15, 1862, ch. 72, § 1, 12 Stat. 387, 387 (codified as amended at 7 U.S.C. § 2201 (2000)). Later amendments expanded the Department's mission to include rural development, *see* Rural Development Act of 1972, Pub. L. No. 92-419, § 603(a), 86 Stat. 657, 675, and aquaculture and human nutrition, *see* Food and Agriculture Act of 1977, Pub. L. No. 95-113, § 1502(a), 91 Stat. 913, 1021. *See generally* GLADYS BAKER ET AL., CENTURY OF SERVICE: THE FIRST 100 YEARS OF THE UNITED STATES DEPARTMENT OF AGRICULTURE (1963).

289 7 U.S.C. § 2581.

290 Asgrow Seed Co. v. Winterboer, 982 F.2d 486, 491 (Fed. Cir. 1992), *rev'd on other grounds*, 513 U.S. 179 (1995); *accord* Delta & Pine Land Co. v. Peoples Gin Co., 694 F.2d 1012, 1016 (5th Cir. 1983).

291 *See* JULIAN M. ALSTON & RAYMOND J. VENNER, INT'L FOOD POLICY RESEARCH INST., THE EFFECTS OF THE U.S. PLANT VARIETY PROTECTION ACT ON WHEAT GENETIC IMPROVEMENT 31 (2000), *available at* http://www.grain.org/docs/eptdp62.pdf; KLOPPENBURG, *supra* note 12, at 140–50; Janis & Kesan, *supra* note 26, at 775–76.

292 *See* sources cited *supra* note 291.

brown-bag sales prompted commercial plant breeders to shift their research from self-pollinated crops to hybrids.[293] Unlike self-pollinated and tuber-propagated plants, hybrids enjoy a biological immunity from easy duplication.[294] This distortion of agricultural research brings with it a lamentable preference for the law of trade secrets over the PVPA and patent law. Whatever their flaws, federal intellectual property laws boast the singular virtue of forcing inventions into the public domain once their terms of protection expire.

Moreover, to the extent that breeders do continue work on self-pollinated and tuber-propagated plants, further weakening of the PVPA will enhance their incentives to develop technologies controlling plant gene expression.[295] Genetic Use Restriction Technologies (GURTs) such as the hotly controversial Technology Protection System[296] are likely to proliferate in response to the perceived weakness of statutory and contractual means for protecting plant breeders' investments in research and development. Though a full discussion of

293 *See* OFFICE OF TECH. ASSESSMENT, 102D CONG., BIOTECHNOLOGY IN A GLOBAL ECONOMY 109 (1991); Neil D. Hamilton, *Who Owns Dinner: Evolving Legal Mechanisms for Ownership of Plant Genetic Resources*, 28 TULSA L.J. 587, 639 (1993); *cf.* Mary K. Knudson & Vernon W. Ruttan, *Research and Development of a Biological Innovation: Commercial Hybrid Wheat*, 21 FOOD RES. INST. STUD. 45 (1988) (predicting the shift from self-pollinating to hybrid crops before the controversy over brown-bag sales and the PVPA's crop exemption reached its apex).

294 *See* P. Stephen Baenziger et al., *Breeding Pure Line Cultivars*, *in* ENCYCLOPEDIA OF PLANT AND CROP SCIENCE, *supra* note 164, at 196, 196.

295 *See* F. Scott Kieff, *Patents for Environmentalists*, 9 WASH. U. J.L. & POL'Y 307, 318–19 (2002).

296 *See* Control of Plant Gene Expression, U.S. Patent No. 5,723,765 (filed Mar. 3, 1998). The other patents, Nos. 5,925,808 and 5,977,441, were also named "Control of Plant Gene Expression." These patents belong jointly to the Department of Agriculture and to the Delta and Pine Land Company. Although critics of the Technology Protection System almost uniformly call it "terminator" technology, I will eschew that inflammatory and misleading moniker. Patrick Mooney, executive director of the Rural Advancement Foundation International, appears to have coined the mocking nickname preferred by almost all opponents of plant gene expression control technology: the "terminator." *See* Bill Lambrecht, *Critics Vilify New Seed Technology That Monsanto May Soon Control—'Terminator' Would Prevent Saving Seeds by Making Them Sterile*, ST. LOUIS POST-DISPATCH, Nov. 1, 1998, at A1. I endorse Dan Burk's decision "to avoid this nomenclature," which carries "certain rhetorical implications that are unhelpful to serious analysis of the technology's impact" and which creates confusion with the use of the term "terminator" in molecular biology to "refer[ ] to a specific type of genetic control sequence that is not employed in GURTs." Burk, *supra* note 15, at 1558 n.20 (citing the description of RNA terminator control sequences in JAMES D. WATSON ET AL., MOLECULAR BIOLOGY OF THE GENE 377–78 (4th ed. 1987)).

GURTs lies beyond the scope of this Article,[297] the very existence of research funds invested in their development, elaboration, and deployment is evidence of legal failure. Resources devoted to the enforcement of legal rights are spent at the expense of actual innovation.[298]

As currently configured, the PVPA has fallen short of its lofty aspiration to spur innovation in plant breeding. The ceiling on the PVPA's success is most fairly attributed to the statute's "limited" scope of protection, the ease with which the statute can be circumvented, and the presence of the research and crop exemptions.[299] The PVPA thus represents a rare instance in the annals of contemporary intellectual property law in which proprietary protection is not excessive, but rather insufficiently robust. The PVPA's shabby record might be improved through the application of the interpretive canon proposed in this Article. No canon of statutory interpretation warrants respect if its "sole consistency" is that one side "always wins."[300] The "Progress of Science and useful Arts" often counsels restraint in the granting of intellectual property and alacrity in defense of the public interest in broad dissemination and ultimately of the public domain. The PVPA, by contrast, teaches a somewhat different lesson. Limitations on the scope of protection available under that statute have visibly stunted incentives to innovate within the plant breeding industry.

Finally, it is worth remembering that the inventive process is in many respects a random walk. Whatever else it might be, innovation is utterly unpredictable. Creative endeavors enjoy no monopoly on the insight that output does not necessarily correspond to effort. "[T]he race is not to the swift, nor the battle to the strong, nor bread to the wise, nor riches to the intelligent, nor favor to the men of skill; but time and chance happen to them all."[301] The value of talent "bears little relation to cost of tools and supplies and labor to develop it."[302] As a game of chance, industrial research and development exhibits no greater rationality in linking return to investment than does

297 Dan Burk has made some effort to explore GURTs and their impact on the law of intellectual property. *See* Burk, *supra* note 15; Dan L. Burk, *Lex Genetica: The Law and Ethics of Programming Biological Code*, 4 ETHICS & INFO. TECH. 109 (2002).

298 As the Indigo Girls would express the sentiment, "I've had enough temporary acquisition / Building fences for no gain." INDIGO GIRLS, *Devotion*, *on* RETROSPECTIVE (Sony 2000).

299 *See* Janis & Kesan, *supra* note 26, at 774.

300 United States v. Von's Grocery Co., 384 U.S. 270, 301 (1966) (Stewart, J., dissenting).

301 *Ecclesiastes* 9:11.

302 Fed. Power Comm'n v. Hope Natural Gas Co., 320 U.S. 591, 648 (1944) (Jackson, J., dissenting).

a "game of poker."[303] Neither causation nor correlation connects investment levels or product prices with the creation of knowledge.[304]

Seemingly random in its origins and arbitrary in its outcomes, the lack of regularity within the innovative process sits poorly with those who prefer that reward bear some systematic relation to investment. Losers in the innovation lottery are likely to resent the winners, or even those who metaphorically "worked only one hour" and yet have been rewarded no less than those "who have borne the burden of the day and the scorching heat."[305] No less in the realm of invention than in "the kingdom of heaven" likened to the manor whose master "went out early in the morning to hire laborers for his vineyard,"[306] "the last will be first, and the first last."[307] So teaches another of the New Testament's agrarian parables, the parable of the sower:

> A sower went out to sow. And as he sowed, some seeds fell along the path, and the birds came and devoured them. Other seeds fell on rocky ground, where they had not much soil, and immediately they sprang up, since they had no depth of soil, but when the sun rose they were scorched; and since they had no root they withered away. Other seeds fell upon thorns, and the thorns grew up and choked them. Other seeds fell on good soil and brought forth grain, some a hundredfold, some sixty, some thirty. He who has ears, let him hear.[308]

303 *Id.* at 649.

304 *See* David C. Mowery & Nathan Rosenberg, *The Influence of Market Demand upon Innovation: A Critical Review of Some Recent Empirical Studies*, 8 RES. POL'Y 102 (1989) (using this charge to criticize the earliest "demand-driven" models of technological change).

305 *Matthew* 20:12.

306 *Matthew* 20:1.

307 *Matthew* 20:16.

308 *Matthew* 13:3–9.

STATUTORY APPENDIX

Selected Sections of the Plant Variety Protection Act of 1970,[1] *as Amended*[2]

Section 2401. *Definitions and rules of construction*

(a) *Definitions*

As used in this chapter:

(1) *Basic seed*

The term "basic seed" means the seed planted to produce certified or commercial seed.

(2) *Breeder*

The term "breeder" means the person who directs the final breeding creating a variety or who discovers and develops a variety. . . . The term does not include a person who redevelops or rediscovers a variety the existence of which is publicly known or a matter of common knowledge.

(3) *Essentially derived variety*

(A) *In general*

The term "essentially derived variety" means a variety that—

(i) is predominantly derived from another variety (referred to in this paragraph as the "initial variety") or from a variety that is predominantly derived from the initial variety, while retaining the expression of the essential characteristics that result from the genotype or combination of genotypes of the initial variety;

(ii) is clearly distinguishable from the initial variety; and

(iii) 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.

(B) *Methods*

An essentially derived variety may be obtained by the selection of a natural or induced mutant or of a somaclonal variant, the selection of a variant individual from plants of the initial variety, backcrossing, transformation by genetic engineering, or other method.

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1 Pub. L. No. 91-577, 84 Stat. 1542.

2 Federal Agriculture Improvement and Reform Act of 1996, Pub. L. No. 104-127, 110 Stat. 1186; Plant Variety Protection Act Amendments of 1994, Pub. L. No. 103-349, 108 Stat. 3136; Patent and Plant Variety Protection Remedy Clarification Act, Pub. L. No. 102-560, 106 Stat. 4231 (1992); Act of Dec. 22, 1980, Pub. L. No. 96-574, 94 Stat. 3351.

(4) *Kind*

The term "kind" means one or more related species or subspecies singly or collectively known by one common name, such as soybean, flax, or radish.

(5) *Seed*

The term "seed", with respect to a tuber propagated variety, means the tuber or the part of the tuber used for propagation.

(6) *Sexually reproduced*

The term "sexually reproduced" includes any production of a variety by seed, but does not include the production of a variety by tuber propagation.

(7) *Tuber propagated*

The term "tuber propagated" means propagated by a tuber or a part of a tuber.

. . . .

(9) *Variety*

The term "variety" means a plant grouping within a single botanical taxon of the lowest known rank, that, without regard to whether the conditions for plant variety protection are fully met, can be defined by the expression of the characteristics resulting from a given genotype or combination of genotypes, distinguished from any other plant grouping by the expression of at least one characteristic and considered as a unit with regard to the suitability of the plant grouping for being propagated unchanged. A variety may be represented by seed, transplants, plants, tubers, tissue culture plantlets, and other matter.

(b) *Rules of construction*

For the purposes of this chapter:

(1) *Sale or disposition for nonreproductive purposes*

The sale or disposition, for other than reproductive purposes, of harvested material produced as a result of experimentation or testing of a variety to ascertain the characteristics of the variety, or as a by-product of increasing a variety, shall not be considered to be a sale or disposition for purposes of exploitation of the variety.

(2) *Sale or disposition for reproductive purposes*

The sale or disposition of a variety for reproductive purposes shall not be considered to be a sale or disposition for the purposes of exploitation of the variety if the sale or disposition is done as an integral part of a program of experimentation or testing to ascertain the characteristics of the variety, or to increase the variety on behalf of the breeder or the successor in interest of the breeder.

(3) *Sale or disposition of hybrid seed*

The sale or disposition of hybrid seed shall be considered to be a sale or disposition of harvested material of the varieties from which the seed was produced.

(4) *Application for protection or entering into a register of varieties*

The filing of an application for the protection or for the entering of a variety in an official register of varieties, in any country, shall be considered to render the variety a matter of common knowledge from the date of the application, if the application leads to the granting of protection or to the entering of the variety in the official register of varieties, as the case may be.

(5) *Distinctness*

The distinctness of one variety from another may be based on one or more identifiable morphological, physiological, or other characteristics (including any characteristics evidenced by processing or product characteristics, such as milling and baking characteristics in the case of wheat) with respect to which a difference in genealogy may contribute evidence.

(6) *Publicly known varieties*

(A) *In general*

A variety that is adequately described by a publication reasonably considered to be a part of the public technical knowledge in the United States shall be considered to be publicly known and a matter of common knowledge.

(B) *Description*

A description that meets the requirements of subparagraph (A) shall include a disclosure of the principal characteristics by which a variety is distinguished.

(C) *Other means*

A variety may become publicly known and a matter of common knowledge by other means.[3]

Section 2402. *Right to plant variety protection; plant varieties protectable*

(a) *In general*

The breeder of any sexually reproduced or tuber propagated plant variety (other than fungi or bacteria) who has so reproduced the variety, or the successor in interest of the breeder, shall be entitled to plant variety protection for the variety, subject to the conditions and requirements of this chapter, if the variety is—

(1) new, in the sense that, on the date of filing of the application for plant variety protection, propagating or harvested material of the variety has not been sold or otherwise disposed of to other

3 7 U.S.C. § 2401 (2000).

persons, by or with the consent of the breeder, or the successor in interest of the breeder, for purposes of exploitation of the variety—

(A) in the United States, more than 1 year prior to the date of filing; or

(B) in any area outside of the United States—

(i) more than 4 years prior to the date of filing . . . ; or

(ii) in the case of a tree or vine, more than 6 years prior to the date of filing;

(2) distinct, in the sense that the variety is clearly distinguishable from any other variety the existence of which is publicly known or a matter of common knowledge at the time of the filing of the application;

(3) uniform, in the sense that any variations are describable, predictable, and commercially acceptable; and

(4) stable, in the sense that the variety, when reproduced, will remain unchanged with regard to the essential and distinctive characteristics of the variety with a reasonable degree of reliability commensurate with that of varieties of the same category in which the same breeding method is employed.[4]

Section 2404. *Public interest in wide usage*

The Secretary may declare a protected variety open to use on a basis of equitable remuneration to the owner, not less than a reasonable royalty, when the Secretary determines that such declaration is necessary in order to insure an adequate supply of fiber, food, or feed in this country and that the owner is unwilling or unable to supply the public needs for the variety at a price which may reasonably be deemed fair. Such declaration may be, with or without limitation, with or without designation of what the remuneration is to be; and shall be subject to review . . . (any finding that the price is not reasonable being reviewable), and shall remain in effect not more than two years. In the event litigation is required to collect such remuneration, a higher rate may be allowed by the court.[5]

Section 2422. *Content of application*

An application for a certificate recognizing plant variety rights shall contain:

(1) The name of the variety except that a temporary designation will suffice until the certificate is to be issued. The variety shall be named in accordance with regulations issued by the Secretary.

(2) A description of the variety setting forth its distinctiveness, uniformity, and stability and a description of the genealogy and breeding procedure, when known. The Secretary may require am-

4 *Id.* § 2402.

5 *Id.* § 2404.

plification, including the submission of adequate photographs or drawings or plant specimens, if the description is not adequate or as complete as is reasonably possible, and submission of records or proof of ownership or of allegations made in the application. An applicant may add to or correct the description at any time, before the certificate is issued, upon a showing acceptable to the Secretary that the revised description is retroactively accurate. Courts shall protect others from any injustice which would result. The Secretary may accept records of the breeder and of any official seed certifying agency in this country as evidence of stability where applicable.

(3) A statement of the basis of the claim of the applicant that the variety is new.

(4) A declaration that a viable sample of basic seed (including any propagating material) necessary for propagation of the variety will be deposited and replenished periodically in a public repository in accordance with regulations to be established hereunder.

(5) A statement of the basis of applicant's ownership.[6]

Section 2483. *Contents and term of plant variety protection*

(a) *Certificate*

(1) Every certificate of plant variety protection shall certify that the breeder (or the successor in interest of the breeder), has the right, during the term of the plant variety protection, to exclude others from selling the variety, or offering it for sale, or reproducing it, or importing it, or exporting it, or using it in producing (as distinguished from developing) a hybrid or different variety therefrom, to the extent provided by this chapter.

(2) If the owner so elects, the certificate shall—

(A) specify that seed of the variety shall be sold in the United States only as a class of certified seed; and

(B) if so specified, conform to the number of generations designated by the owner.

(3) An owner may waive a right provided under this subsection, other than a right that is elected by the owner under paragraph (2)(A).

(4) The Secretary may at the discretion of the Secretary permit such election or waiver to be made after certificating and amend the certificate accordingly, without retroactive effect.

(b) *Term*

(1) *In general*

Except as provided in paragrpah (2), the term of plant variety protection shall expire 20 years from the date of issue of the certificate in the United States, execpt that—

(A) in the case of a tuber propagated plant variety subject to a waiver granted under section 2402(a)(1)(B)(i) of this title,

6 *Id.* § 2422.

the term of the plant variety protection shall expire 20 years after the date of the original grant of the plant breeder's rights to the variety outside of the United States; and

(B) in the case of a tree or vine, the term of the plant variety protection shall expire 25 years from the date of issue of the certificate

(2) *Exceptions*

If the certificate is not issued within three years from the effective filing date, the Secretary may shorten the term by the amount of delay in the prosecution of the application attributed by the Secretary to the applicant.

(c) *Expiration upon failure to comply with regulations; notice*

The term of plant variety protection shall also expire if the owner fails to comply with regulations, in force at the time of certificating, relating to replenishing seed in a public repository . . . .[7]

Section 2541. *Infringement of plant variety protection*

(a) *Acts constituting infrigement*

Except as otherwise provided in this subchapter, it shall be an infringement of the rights of the owner of a protected variety to perform without authority, any of the following acts in the United States, or in commerce which can be regulated by Congress or affecting such commerce, prior to expiration of the right to plant variety protection but after either the issue of the certificate or the distribution of a protected plant variety with the notice under section 2567 of this title:

(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 or a part of 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;

(5) use seed which had been marked "Unauthorized Propagation Prohibited" or "Unauthorized Seed Multiplication Prohibited" or progeny thereof to propagate the variety;

(6) dispense the variety to another, in a form which can be propagated, without notice as to being a protected variety under which it was received;

(7) condition the variety for the purpose of propagation, except to the extent that the conditioning is related to the activities permitted under section 2543 of this title;

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7 *Id.* § 2483.

(8) stock the variety for any of the purposes referred to in paragraphs (1) through (7);

(9) perform any of the foregoing acts even in instances in which the variety is multiplied other than sexually, except in pursuance of a valid United States plant patent; or

(10) instigate or actively induce performance of any of the foregoing acts.

. . . .

(c) *Applicability to certain plant varieties*

This section shall apply equally to—

(1) any variety that is essentially derived from a protected variety, unless the protected variety is an essentially derived variety;

(2) any variety that is not clearly distinguishable from a protected variety;

(3) any variety whose production requires the repeated use of a protected variety; and

(4) harvested material (including entire plants and parts of plants) obtained through the unauthorized use of propagating material of a protected variety, unless the owner of the variety has had a reasonable opportunity to exercise the rights provided under this chapter with respect to the propagating material.

(d) *Acts not considered infringing*

It shall not be an infringement of the rights of the owner of a variety to perform any act concerning propagating material of any kind, or harvested material, including entire plants and parts of plants, of a protected variety 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 or involves an export of material of the variety, that enables the propagation of the variety, into a country that does not protect varieties of the plant genus or species to which the variety belongs, unless the exported material is for final consumption purposes.

(e) *Private, noncommercial uses*

It shall not be an infringement of the rights of the owner of a variety to perform any act done privately and for noncommercial purposes.

(f) *"Perform without authority" defined*

As used in this section, the term "perform without authority" includes performance without authority by any State, any instrumentality of a State, and any officer or employee of a State or instrumentality of a State acting in the official capacity of the officer or employee. Any State, and any such instrumentality, officer, or employee, shall be subject to the provisions of this chapter in the same manner and to the same extent as any nongovernmental entity.[8]

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8 *Id.* § 2541.

Section 2543. *Right to save seed; crop exemption*

Except to the extent that such action may constitute an infringement under subsections (3) and (4) of section 2541 of this title, it shall not infringe any right hereunder for a person to save seed produced by the person from seed obtained, or descended from seed obtained, by authority of the owner of the variety for seeding purposes and use such saved seed in the production of a crop for use on the farm of the person, or for sale as provided in this section. A bona fide sale for other than reproductive purposes, made in channels usual for such other purposes, of seed produced on a farm either from seed obtained by authority of the owner for seeding purposes or from seed produced by descent on such farm from seed obtained by authority of the owner for seeding purposes shall not constitute an infringement. A purchaser who diverts seed from such channels to seeding purposes shall be deemed to have notice under section 2567 of this title that the actions of the purchaser constitute an infringement.[9]

Section 2544. *Research exemption*

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.[10]

Section 2581. *Intent*

It is the intent of Congress to provide the indicated protection for new varieties by exercise of any constitutional power needed for that end, so as to afford adequate encouragement for research, and for marketing when appropriate, to yield for the public the benefits of new varieties. Constitutional clauses 3 and 8 of article I, section 8 are both relied upon.[11]

Section 2582. *Severability*

If this chapter is held unconstitutional as to some provisions or circumstances, it shall remain in force as to the remaining provisions and other circumstances.[12]

9 *Id.* § 2543 (footnote omitted).
10 *Id.* § 2544.
11 *Id.* § 2581.
12 *Id.* § 2582.