

# A FRAMEWORK FOR PATENT EXHAUSTION OF SELF-REPLICATING TECHNOLOGIES

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## I. INTRODUCTION

A patent is a “right to exclude others from making, using, offering for sale, [] selling,” or importing the patented invention.<sup>1</sup> But that right has limits, one of which is the doctrine of patent exhaustion. Exhaustion extinguishes the patent owner’s rights of exclusion over the use, sale, and import of objects that have been the subject of a patentee-authorized sale.<sup>2</sup> The effect: the buyer can use, sell, and import the *particular object* that they bought without being liable for infringement.

There are two main levers that drive the operation of patent exhaustion: the *objects* over which exhaustion occurs and the *rights* that exhaustion affects. The key to the *objects* lever is that exhaustion applies only to tangible objects that embody the patented invention, not to the underlying intangible knowledge. The effect of this distinction is that exhaustion “restricts a patentee’s rights *only as to the ‘particular article’ sold . . .*”<sup>3</sup> The key to the *rights* lever is that exhaustion applies to *using*, but not *making*. The effect of this distinction is that the application of exhaustion “leaves untouched the patentee’s ability to prevent a buyer from *making new copies* of the patented item.”<sup>4</sup> The effect of both levers in concert is a balance between the rights of someone who purchases a tangible object against the rights of someone who

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DOI: <https://doi.org/10.15779/Z38SF2MC66>

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1. 35 U.S.C. § 154(a)(1) (2018).

2. *See* *Impression Prods. v. Lexmark Int’l, Inc.*, 137 S. Ct. 1523, 1526 (2017) (stating that exhaustion occurs “[w]hen a patentee sells an item,” making “that product ‘[] no longer within the limits of the patent monopoly’ and instead [] the ‘private, individual property’ of the purchaser”) (original alterations excluded) (quoting *Bloomer v. McQuewan*, 55 U.S. 539, 549–550 (1853)).

3. *Bowman v. Monsanto Co.*, 569 U.S. 278, 284 (2013) (emphases added) (citation omitted).

4. *Id.*

owns a patent covering the intangible knowledge embodied in that tangible object.

But the application of these two distinctions—between the tangible and the intangible, and between using and making—appears to break down in the context of a crucial segment of the modern invention economy: self-reproducing technologies.<sup>5</sup> Such technologies, as the name suggests, are inherently able to make more copies of themselves. They therefore present a complex twist on the application of the doctrine of patent exhaustion. When an item has the ability to reproduce itself, the line between “using” (which is excused by exhaustion) and “making” (which is not), is quickly blurred.

The concept of self-reproducing technology sounds futuristic, conjuring images of “nanorobots or organic computers,”<sup>6</sup> or even construction modules in outer space.<sup>7</sup> But self-reproducing technologies are more common than that list implies. Many modern technologies—from vaccines,<sup>8</sup> cell cultures,<sup>9</sup> and recombinant protein production systems,<sup>10</sup> to even “‘living’ cement”<sup>11</sup>—contain DNA or RNA, enabling self-reproduction.<sup>12</sup> Yet the quintessential

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5. This Note uses the terms “self-replicating” and “self-reproducing” interchangeably.

6. Jeremy N. Sheff, *Self-Replicating Technologies*, 16 STAN. TECH. L. REV. 229, 230 (2013).

7. See Tom Kalil, *Bootstrapping a Solar System Civilization*, OBAMA WHITE HOUSE BLOG ARCHIVES (Oct. 14, 2014), <https://obamawhitehouse.archives.gov/blog/2014/10/14/bootstrapping-solar-system-civilization>.

8. See, e.g., Karl Ljungberg & Peter Liljeström, *Self-Replicating Alphavirus RNA Vaccines*, 14 EXPERT REV. VACCINES 177–194 (Oct. 1, 2014), <https://doi.org/10.1586/14760584.2015.965690> (describing self-replicating vaccines).

9. See, e.g., ThermoFisher Scientific, *Introduction to Cell Culture*, TECH. REFERENCE LIBR., <https://www.thermofisher.com/us/en/home/references/gibco-cell-culture-basics/introduction-to-cell-culture.html> (last visited Dec. 13, 2019).

10. For example, the vast majority of rennet (a protein used to make cheese) and insulin (for diabetes treatment) used today are recombinantly produced in industrial microbial bioreactors. Valentin Waschulin & Liz Specht, *Cellular Agriculture: An Extension of Common Production Methods for Food*, GOOD FOOD INST. 1, 5, 10 (Mar. 6, 2018), <https://www.gfi.org/images/uploads/2018/03/Cellular-Agriculture-for-Animal-Protein.pdf>.

11. See Robert F. Service, *From ‘Living’ Cement to Medicine-Delivering Biofilms*, *Biologists Remake the Material World*, SCIENCE (Feb. 18, 2020, 1:50 PM), <https://www.sciencemag.org/news/2020/02/living-cement-medicine-delivering-biofilms-biologists-remake-material-world#>.

12. Not everything that contains DNA or RNA is necessarily capable of self-reproduction, however. For example, engineers recently 3D-printed a plastic bunny containing DNA that encodes instructions for 3D printing more bunnies, but these bunnies do not themselves read and carry out the instructions to reproduce *on their own*. Loyal Liverpool, *3D-Printed Bunny Contains DNA Instructions to Make a Copy of Itself*, NEW SCI. (Dec. 9, 2019), <https://www.newscientist.com/article/2226644-3d-printed-bunny-contains-dna-instructions-to-make-a-copy-of-itself/#ixzz680sF3YdD>.

self-reproducing technology is even more familiar and provides the basis for a large segment of the economy: the seed.

Despite these technologies' growing importance, there is currently no clear guidance for applying exhaustion to self-reproducing technologies. The Supreme Court has most recently addressed patent exhaustion in two cases: *Bowman v. Monsanto Co.*<sup>13</sup> and *Impression Prods. v. Lexmark Int'l, Inc.*<sup>14</sup> *Bowman* addressed self-reproducing technologies specifically but issued a narrow holding, while *Lexmark* did not specifically address self-reproducing technologies but issued a broader holding. These two cases speak to different parts of the problem and have not yet been integrated against the background of a clear understanding of the tort elements of patent law. This Note does just that, providing the first comprehensive integration of modern exhaustion caselaw with self-reproducing technologies.

In *Bowman*, the Court held that a farmer's intentional replanting of patented seeds was not protected by exhaustion.<sup>15</sup> But *Bowman* explicitly left open two questions about how the doctrine of exhaustion might apply to self-reproducing technologies more generally.<sup>16</sup> Four years later, the Court in *Lexmark* held that exhaustion automatically applies in authorized sales of patented items, regardless of the presence of post-sale restrictions, and regardless of where the sale takes place.<sup>17</sup> But *Lexmark* did not address or even reference *Bowman's* questions, which today remain apparently unanswered.<sup>18</sup>

In this Note, I argue that we already have all the tools to answer *Bowman's* questions: the analysis in *Bowman* implicitly suggests answers to its own questions, and the broad framework of *Lexmark* makes those answers clear. Specifically, *Bowman* deconstructs the core using-versus-making issue, and *Lexmark* puts exhaustion to work on that issue by broadly structuring exhaustion's theory and policy rationale. Put together against a firmly-rooted tort-based understanding of patent infringement, these two cases build a concise and robust framework—which I have termed “Bowmark”—for applying exhaustion to self-reproducing technologies in situations beyond *Bowman's* limited holding. This framework proves to be workable against *Bowman's* open questions and reveals that, to the extent that there are still gray

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13. *Bowman v. Monsanto Co.*, 569 U.S. 278 (2013).

14. *Impression Prods. v. Lexmark Int'l, Inc.*, 137 S. Ct. 1523 (2017).

15. *Bowman*, 569 U.S. at 280.

16. *Id.* at 289.

17. *Lexmark*, 137 S. Ct. at 1535.

18. See James B. Kobak, Jr., *Lexmark*, *The Overruling of Mallinckrodt and The Future of Restraints on Alienation for Patented Goods*, 99 J. PAT. & TRADEMARK OFF. SOC'Y 609, 622 (2017).

areas regarding the role of patent law in the situations explicitly unaddressed by *Bowman*, those gray areas do not involve or invoke exhaustion.

The remainder of this Note is divided into five Parts. Part II summarizes the exhaustion doctrine. Part III walks through special aspects of protecting intellectual property (IP) in self-reproducing technology, focusing on plants. Part IV delves into the contexts and reasoning of *Bowman* and *Lexmark*. Part V unpacks *Bowman*'s questions using the *Bowmark* framework, working through how exhaustion could apply to self-reproducing technologies whose reproduction is (1) "outside the purchaser's control"<sup>19</sup> or (2) is "a necessary but incidental step in using the item for another purpose."<sup>20</sup> Part V ultimately concludes that the exhaustion doctrine does not need to be altered for the sake of self-replicating technologies.

## II. WHAT EXHAUSTION IS—AND WHAT IT ISN'T

Before dissecting *Bowman* and *Lexmark*, we must build a thorough foundation of what exhaustion is and is not. Exhaustion discourse is laden with archaic terms like "alienation of chattels,"<sup>21</sup> which distract from the fact that exhaustion is simply a defense to patent infringement.<sup>22</sup> Thus, to understand the proper application of exhaustion, infringement must first be clear.

### A. EXHAUSTION FIRST REQUIRES AN INFRINGEMENT ANALYSIS

It is easy to forget that patent infringement is and "has always been a tort . . ." <sup>23</sup> Indeed, courts have often been confused or "undisciplined"<sup>24</sup> about the tort dimensions of patent law, so it is worth explicitly walking through the standards for infringement.

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19. *Bowman*, 569 U.S. at 289.

20. *Id.*

21. *See, e.g., Lexmark*, 137 S. Ct. at 1526 (quoting *Kirtsaeng v. John Wiley & Sons, Inc.*, 568 U.S. 519, 538 (2013)).

22. *See id.* at 1530. Note that "[w]hile the exhaustion doctrine has been developed in the context of utility patents," it also applies in the context of plant patents. Leah Chan Grinvald & Ofer Tur-Sinai, *Intellectual Property Law and the Right to Repair*, 88 FORDHAM L. REV. 63, 112 n.272 (Oct. 2019). *See, e.g., Int'l Fruit Genetics, L.L.C. v. Orcharddepot.com*, No. 4:17-CV-02905-JSW, slip op. at 4 (N.D. Cal. Feb. 12, 2018) (order denying motion to dismiss) (stating that exhaustion did not apply to the defendant's infringement of grapevines covered by plant patents because the plants at issue were licensed, not sold).

23. Saurabh Vishnubhakat, *Commil v. Cisco and the Tort of Patent Infringement*, WRITTEN DESCRIPTION (Dec. 9, 2014, 12:46 AM), <https://writtendescription.blogspot.com/2014/12/commil-v-cisco-and-tort.html>; *see also* PETER S. MENELL, MARK A. LEMLEY & ROBERT P. MERGES, *INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE*: 2017 368 (2017).

24. Vishnubhakat, *Commil v. Cisco*, *supra* note 23.

Infringement can be direct or indirect, but indirect infringement still requires “at least one act of direct infringement.”<sup>25</sup> Direct patent infringement is often called a “strict liability” offense<sup>26</sup> in that “innocent” infringement is still infringement,<sup>27</sup> and there is no requirement that the infringer intended or even knew of their own infringement.<sup>28</sup> That being said, there is still a minimum standard: the direct infringer must *act* in some way.<sup>29</sup> And that act must implicate the intangible knowledge of the patent.<sup>30</sup> For direct infringement, the “act” is making, using, selling, offering to sell, or importing a patented invention without authority from the patent holder.<sup>31</sup>

It is useful at this point to keep in mind Syed’s articulation of what a patent actually represents: patent rights, he argues, are ultimately tied to the *intangible knowledge* of tangible things, not to the tangible things themselves.<sup>32</sup> Patents, after all, are a form of *intellectual* property. Tangible things are mere chattels embodying patented knowledge. Infringing a patent requires acting on that knowledge in an unauthorized manner.<sup>33</sup>

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25. Menell, Lemley & Merges, *supra* note 23, at 368.

26. Saurabh Vishnubhakat, *An Intentional Tort Theory of Patents*, 68 FLA. L. REV. 571, 573 (2016), <https://ssrn.com/abstract=2492200>.

27. See 5 Donald S. Chisum, *Chisum on Patents* § 16.02(2) (2019).

28. Vishnubhakat, *An International Tort Theory of Patents*, *supra* note 26, at 573.

29. Furthermore, the act must be manifested externally and committed voluntarily. The necessity in tort law for such an act as a prerequisite for liability is well-established. See Restatement (Second) of Torts § 2 (Am. Law Inst. 1965). Its continued necessity specifically within the context of intellectual property law is also well-established. See *ABC, Inc. v. Aereo, Inc.*, 573 U.S. 431, 453 (2014) (Scalia, J., dissenting).

30. See Talha Syed, *Dephysicalizing Patent Eligibility*, 9 (draft on file with the author) (“And similarly for patents: just as the underlying object of copyright’s tangibly-fixed expressive form remains an intangible form of expression, so the object of a tangibly-embodied knowledge space remains an intangible space of knowledge.”).

31. 35 U.S.C. § 271(a) (2018). Any one of those acts, if “performed by or attributable to a single entity,” constitutes direct infringement. Acts by another can be attributed to a single entity for direct infringement either vicariously or through joint enterprise. Vicarious liability requires that the entity “directs or controls” the other’s actions. *Akamai Techs., Inc. v. Limelight Networks, Inc.*, 797 F.3d 1020, 1022 (Fed. Cir. 2015) (citations omitted). Thus, there is no direct infringement (and no infringement at all) unless a single entity completes an entire infringing act themselves—either personally, vicariously, or jointly. See Menell, Lemley & Merges, *supra* note 23, at 368.

32. See Syed, *supra* note 30, at 4; see also *Impression Prods. v. Lexmark Int’l, Inc.*, 137 S. Ct. 1523, 1537 (2017) (distinguishing “the *article* and the *invention which it embodies*”) (emphases added) (citations omitted). Note that “intangible knowledge of tangible things” is *not* the same as abstract ideas or laws of nature, which the Court has held to not be patent eligible subject matter under 35 U.S.C. § 101. See Syed, *supra* note 30, at 5–6.

33. *E.g.*, unauthorized use, sale, import, or making. See Syed, *supra* note 30, at 10–11.

Once there is direct infringement, there may also be indirect infringement.<sup>34</sup> Unlike direct infringement, indirect infringement requires a heightened mental state regarding the infringement.<sup>35</sup> Indirect infringement includes induced infringement<sup>36</sup> and contributory infringement.<sup>37</sup>

Induced infringement “involves behavior that omits any direct making, using, or selling of the patented invention, but that nevertheless amounts to an attempt to appropriate the value of the invention.”<sup>38</sup> It can encompass a broad range of activities and “is often described as activity that ‘aids and abets’ infringement.”<sup>39</sup> Liability for induced infringement “requires knowledge that the induced acts constitute patent infringement,”<sup>40</sup> or willful blindness thereto.<sup>41</sup>

Contributory infringement essentially involves providing components of patented inventions,<sup>42</sup> while knowing “that the combination for which [the] component was especially designed was both patented and infringing,”<sup>43</sup> even if the components themselves do not infringe.<sup>44</sup>

## B. EXHAUSTION

Once there is infringement, exhaustion comes into play at the boundary of the tangible and the intangible. The “tangible” simply refers to a physical item that embodies the patent—the “chattel,” in common law parlance<sup>45</sup>—and the “intangible” refers to the underlying *knowledge* that is the actual object of the patent.<sup>46</sup> Exhaustion applies to the *tangible*,<sup>47</sup> and covers the intangible

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34. See Menell, Lemley, and Merges, *supra* note 23, at 385.

35. See *id.*

36. 35 U.S.C. § 271(b) (2018).

37. 35 U.S.C. § 271(c) (2018).

38. Menell, Lemley & Merges, *supra* note 23, at 385.

39. *Id.*

40. Glob.-Tech Appliances, Inc. v. SEB S.A., 563 U.S. 754, 766 (2011).

41. *Id.* at 768.

42. 35 U.S.C. § 271(c) (2018).

43. Aro Mfg. Co. v. Convertible Top Replacement Co., 377 U.S. 476, 488 (1964).

44. The component must also “constitut[e] a material part of the [patented] invention . . . and not [be] a staple article . . . of commerce suitable for substantial noninfringing use . . . .” 35 U.S.C. § 271(c) (2018); see also Menell, Lemley & Merges, *supra* note 23, at 395–96.

45. In terms of seeds, the tangible object would be an individual seed.

46. See Syed, *supra* note 30, at 4; see also United States v. Univis Lens Co., 316 U.S. 241, 251 (1942) (comfortably distinguishing between an “article and the invention which it embodies”). For seeds, the “intangible” would be the knowledge of any special traits encoded in the seed.

47. See Bowman v. Monsanto Co., 569 U.S. 278, 284 (2013) (stating that “the doctrine restricts a patentee’s rights *only as to the ‘particular article’ sold*”) (emphasis added) (internal quotation and citation omitted).

knowledge only to the extent that the intangible knowledge is incidental to using, making, selling, or importing the tangible.<sup>48</sup> Exhaustion “marks the point where patent rights yield to the common law principle against restraints on alienation”<sup>49</sup> of chattels. Applying exhaustion plucks the individual purchased item out of the patent’s monopoly,<sup>50</sup> allowing that tangible chattel to freely “flow[] through the market.”<sup>51</sup> It can then be used or sold in ways that implicate the patented knowledge without the specter of infringement.

Exhaustion has traditionally not applied when the underlying infringing act is “making.”<sup>52</sup> That may seem like an odd departure, but it makes sense in light of the policy against restraints on alienation of chattels:<sup>53</sup> One cannot reasonably be “restrained” from alienating oneself from a chattel that does not yet exist and may not necessarily ever exist.<sup>54</sup> More importantly, it makes sense insofar as the patented knowledge is essential to “making.”

### III. SPECIAL ASPECTS OF PROTECTING INTELLECTUAL PROPERTY IN SELF-REPRODUCING TECHNOLOGIES

Seeds are the quintessential self-reproducing technology. When someone “uses” a seed to grow a plant, that plant will go on to provide the user exactly with which they started out: new seeds.<sup>55</sup> Seeds are a major driver of the economy. The commercial seed market in the United States was estimated to

48. But the patent monopoly will eventually expire.

49. *Impression Prods. v. Lexmark Int’l, Inc.*, 137 S. Ct. 1523, 1531 (2017).

50. *See id.* at 1531.

51. *Id.* at 1538.

52. *See Bowman*, 569 U.S. at 284 (first citing *Mitchell v. Hawley*, 83 U.S. 544, 548 (1873); then citing *Wilbur-Ellis Co. v. Kuther*, 377 U.S. 422, 424 (1964)).

53. *See Lexmark*, 137 S. Ct. at 1526.

54. *See* 3 DAVID A. THOMAS, THOMPSON ON REAL PROPERTY, Thomas Editions § 28.08 (2019) (stating the rule against perpetuities: “No interest is good unless it must vest, if at all, not later than twenty-one years after some life in being at the creation of the interest . . . .”) (citations omitted). Not all seeds necessarily germinate (“vest”). *See* Steve Knox, *Soybean Seed Germination Concerns*, U. NEB.—LINCOLN INST. AGRIC. AND NAT. RESOURCES: CROPWATCH (Feb. 13, 2019), <https://cropwatch.unl.edu/2019/soybean-seed-germination-concerns>.

55. Whether or not the next generation of seeds is genetically identical to the starting seeds will depend on the genetics of the system. For example, self-pollinating inbred plants will produce progeny that are “genetically identical to each other and to the inbred parent,” University of Nebraska—Lincoln Plant & Soil Sciences eLibrary, *Inbreeding, Hybrid Vigor, and Hybrid Corn*, CORN BREEDING: LESSONS FROM THE PAST, <http://passel.unl.edu/pages/informationmodule.php?idinformationmodule=1075412493&topicorder=9&maxto=12> (last visited Dec. 11, 2019), but plants grown from seeds produced from hybrids will not match their parents. *See* Home & Garden Information Center, *Fruits Not True to Type – Vegetables*, U. MD. EXTENSION, <https://extension.umd.edu/hgic/topics/fruits-not-true-type-vegetables> (last visited Dec. 11, 2019).

be \$5.7 billion in 1997,<sup>56</sup> and in 2017, \$132.8 billion of the gross domestic product came from farms.<sup>57</sup> Globally, the commercial seed market has been estimated to be worth roughly \$50 billion.<sup>58</sup> As such, this Note will focus on seeds as the dominant example of self-reproducing technology, but essentially the same analyses can be applied to other self-reproducing technologies.

#### A. EXHAUSTION AND SELF-REPRODUCING TECHNOLOGIES

The concept of exhaustion can quickly become confusing when applied to self-reproducing technologies. This is because exhaustion traditionally excuses a purchaser from infringement for *using* a patented item, but not for *making new copies* of that item.<sup>59</sup> But self-reproducing technologies, by their very nature, flow seamlessly through cycles of “using” and “making.”

So how can it be that exhaustion allows “use” but not “making”? Traditionally, the reason “use” is exhausted while “making” is not is because the intangible knowledge is not “incidental” to making: it is crucial. But is that also true when an item replicates *itself*? Some have argued<sup>60</sup> that, for self-reproducing technologies, “using” *is* “making,” and thus “making” should thus also be excused by exhaustion. On the other hand, one might just as easily flip that argument on its head and say that, for the same reason, exhaustion applies to *neither* use nor making of self-reproducing technologies. In that case, a legitimate purchaser would be left only with the ability to sell or obtain a license on the item. Both of these options are frustrating. Can one reasonably draw a boundary line somewhere between “use” and “making” in this context? These are exactly the questions that were swirling in the seed intellectual property space<sup>61</sup> as the Supreme Court took up *Bowman*.

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56. Jorge Fernandez-Cornejo, United States Department of Agriculture, *The Seed Industry in U.S. Agriculture: An Exploration of Data and Information on Crop Seed Markets, Regulation, Industry Structure, and Research and Development*, ECON. RES. SERV.: AGRIC. INFO. BULL. NO. 786 1, 7 (Feb. 2004).

57. U.S. Department of Agriculture (USDA), *What is Agriculture's Share of the Overall U.S. Economy?*, ECON. RES. SERV.: DATA PRODS. (Apr. 16, 2019), <https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=58270>. Note that this number includes both animal and plant farming. But even animal farming is an indirect output of plant crops, because livestock depend on crops.

58. See Sylvie Bonny, *Corporate Concentration and Technological Change in the Global Seed Industry*, 9 SUSTAINABILITY no. 1632 1, 4–5 (Sept. 14, 2017).

59. See *Bowman v. Monsanto Co.*, 569 U.S. 278, 287 (2013).

60. *Bowman* (unsuccessfully) attempted this argument. See *id.* at 287.

61. See, e.g., Jeremy N. Sheff, *Self-Replicating Technologies*, 16 STAN. TECH. L. REV. 229, 238 (2013); Michael R. Ward, Rachel Krevans & Matthew Chivvis, *Patent Exhaustion & Self-Replicating Technologies*, GENET. ENG. BIOTECHN. N. (Aug. 1, 2012), <https://www.genengnews.com/magazine/186/patent-exhaustion-self-replicating-technologies/>.

But before applying the exhaustion doctrine to seeds, it is important to first understand the special forms of IP protection available for plants in the United States, and how the agricultural market typically handles those rights.

## B. AN OVERVIEW OF PLANT IP PROTECTION IN THE UNITED STATES

U.S. federal law provides three structures for plant IP protection: plant patents, Plant Variety Protection (PVP) certificates, and utility patents.<sup>62</sup> Plant patents were the first formal form of IP available for living organisms,<sup>63</sup> and are available only for asexually reproducing<sup>64</sup> plants, with the exclusion of tubers.<sup>65</sup> Plant patents “have very limited coverage and less stringent requirements than § 101 utility patents.”<sup>66</sup>

In 1970, the United States passed the Plant Variety Protection Act (PVPA).<sup>67</sup> The U.S. Department of Agriculture (USDA) issues PVP certificates under the PVPA,<sup>68</sup> providing IP protection for new, distinct, uniform, and stable plant varieties.<sup>69</sup> PVP applications are simpler than patent applications. But in some respects, they provide weaker protection than

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62. USDA, *Plant Variety Protection*, AGRIC. MARKETING SERV., <https://www.ams.usda.gov/services/plant-variety-protection> (last visited Dec. 11, 2019). Plants may also be trade secrets, and variety names may be trademarked. See, e.g., Michael R. Ward & Elizabeth Freeman Rosenzweig, *Planting the Seeds of Change*, Dec. 2018/Jan. 2019 INTELL. PROP. MAG. 43, 43–44, <https://www.intellectualpropertymagazine.com/patent/planting-the-seeds-of-change-132851.htm>. Those forms of IP are beyond the scope of this Note.

63. Petra Moser & Paul W. Rhode, *Did Plant Patents Create the American Rose?*, THE RATE AND DIRECTION OF INVENTIVE ACTIVITY REVISITED, 413, 413 (Josh Lerner & Scott Stern, eds., 2012). Plant patents came into being after the passage of the Plant Patent Act (PPA) of 1930, codified as 35 U.S.C. §§ 161–164 (2018).

64. As Justice Thomas succinctly described in *J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc.*, “[a]sexual reproduction occurs by grafting, budding, or the like, and produces an offspring with a genetic combination identical to that of the single parent—essentially a clone.” 534 U.S. 124, 132 (2001).

65. 35 U.S.C. § 161 (2018). Plant patents are administered by the U.S. Patent and Trademark Office (USPTO). USPTO, *General Information About 35 U.S.C. 161 Plant Patents*, TYPES OF PAT. APPLICATIONS, <https://www.uspto.gov/patents-getting-started/patent-basics/types-patent-applications/general-information-about-35-usc-161#> (last visited Dec. 11, 2019). Plant patents provide “the right to exclude others from asexually reproducing the plant, and from using, offering for sale, or selling the plant so reproduced, or any of its parts, throughout the United States, or from importing the plant so reproduced, or any parts thereof, into the United States.” 35 U.S.C. § 163 (2018). Examples of plants for which plant patents are granted include roses and fruit trees. See Moser & Rhode, *supra* note 63, at 413.

66. *J.E.M. Ag Supply*, 534 U.S. at 133. Plant patents may contain only one claim, see 35 U.S.C. § 162 (2018), and have a “relaxed” written description requirement compared to utility patents. *J.E.M. Ag Supply*, 534 U.S. at 133.

67. Codified as 7 U.S.C. §§ 2321–2583 (2018).

68. See 7 U.S.C. §§ 2321–2372 (2018).

69. The PVPA covers sexually- and asexually-produced plants. 7 U.S.C. § 2402(a) (2018).

patents, because the PVPAs contain crop and research exemptions.<sup>70</sup> These exemptions permit farmers to save and replant seed<sup>71</sup> and permit breeders and researchers to use and reproduce protected varieties for “breeding or other bona fide research”<sup>72</sup> without infringing the PVP.

The U.S. Patent and Trademark Office (USPTO) began granting *utility* patents on plants in 1985, after the USPTO Board of Patent Appeals and Interferences held in *Ex parte Hibberd*<sup>73</sup> “that plants were . . . within the subject matter of [35 U.S.C.] § 101.”<sup>74</sup> The Supreme Court endorsed this practice in *J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int’l, Inc.*, holding that the existence of plant patents and PVPs does not preclude proper granting of utility patents on plants.<sup>75</sup> Currently, all three types exist in harmony.<sup>76</sup>

### C. A BRIEF PRIMER OF SOME UNIQUE FEATURES OF THE AGRICULTURAL SEED MARKET

The agricultural seed market as we know it today owes its prominence to the development of hybrid seed technology for corn in the early 1900s.<sup>77</sup> Before then, most farmers planted seed saved from previous harvests.<sup>78</sup> Hybrid corn offered a dramatic increase in yield over so-called open-pollinated varieties<sup>79</sup>—but the genetics of the breeding programs required to produce hybrid seeds are so complex that the average farmer cannot produce them themselves, and is thus required to purchase new seed for every crop.<sup>80</sup> Hybrid seeds thus represent a de-coupling of “seed as ‘seed’ from seed as ‘grain,’”<sup>81</sup>

70. Jim Chen, *The Parable of the Seeds: Interpreting the Plant Variety Protection Act in Furtherance of Innovation Policy*, 81 NOTRE DAME L. REV. 105, 125–26 (2006).

71. See 7 U.S.C. § 2543 (2018).

72. 7 U.S.C. § 2544 (2018).

73. 227 U.S.P.Q. (BNA) 443, 444 (1985).

74. *J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int’l, Inc.*, 534 U.S. 124, 131 (2001) (summarizing *Ex parte Hibberd*, 227 U.S.P.Q. at 444).

75. *J.E.M. Ag Supply*, 534 U.S. at 145.

76. See USDA, *supra* note 62.

77. Fernandez-Cornejo, *supra* note 56, at 25.

78. *Id.*

79. See Jack Ralph Kloppenburg, *First the Seed: The Political Economy of Plant Biotechnology* 91 (2004).

80. See *id.* at 99. Hybrid plants do produce seed, but the quirks of hybrid genetics are such that saved seed would produce irregular and lower-yielding plants; “although hybrid seed is not biologically sterile . . . it is in effect ‘economically sterile.’” *Id.* at 97 (citations omitted).

81. *Id.* at 93. That is, the commodity “grains” are no longer equivalent to the seeds required to produce the next season’s crop.

officially making seeds a commodity, whose production and use are necessarily separated.<sup>82</sup> Notably, this took place before the advent of plant patents.<sup>83</sup>

Hybrids quickly found wild success,<sup>84</sup> leading to a handful of large firms dominating seed production for major field crops.<sup>85</sup> Between the spread of hybrid technology and the advent of modern biotechnology and recombinant DNA technology, these seed companies continue to improve the productivity of their seeds.<sup>86</sup> Correspondingly, farmers are purchasing (rather than saving) higher and higher proportions of the seed they use.<sup>87</sup>

Many factors contribute to the market price companies set for their seed, but a large portion is driven by high research and development costs.<sup>88</sup> Even though the growth of the seed market was initially propelled by the inability to replant hybrid seeds,<sup>89</sup> many proprietary seeds today are not hybrid and are fully biologically capable of being replanted.<sup>90</sup> In order to recoup their costs and maintain a profit,<sup>91</sup> therefore, major seed companies typically require

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82. *See id.*

83. *See id.* at 97–105 (tracking the development of hybrid corn from 1905 to 1924).

84. By 1965, more than ninety-five percent by acre of corn in the United States was grown from hybrid seed. Fernandez-Cornejo, *supra* note 56, at 25.

85. *Id.* at 28. “Major field crops” are: corn, soybeans, cotton, and wheat. *Id.*

86. *See* Julie Babinard, *A Short History of Agricultural Biotechnology*, in GENETICALLY MODIFIED ORGANISMS IN AGRICULTURE 272–73 (Elsevier, 2001).

87. For example, acres of soybean and cotton from purchased seed in the United States increased from fifty-five to eighty-one percent and fifty to seventy-eight percent, respectively, between 1982 and 1997. Fernandez-Cornejo, *supra* note 56, at 7. By 1997, seed purchases accounted for four percent of total farm expenditures. *Id.*

88. *Id.* at 29.

89. *See* Kloppenburg, *supra* note 79, at 94.

90. Hybrid seeds are still available today and are the predominant mode of production for many crops, including nearly all corn, sugar beet, and sorghum. *See id.* at 125. But not all crops have been amenable to hybrid technology; wheat, for example, has proven particularly challenging, and most commercial wheat today is not hybrid. *See* Pushpendra Kumar Gupta, Harindra Singh Balyan, Vijay Gahlaut, Gautam Saripalli, Bijendra Pal, Bhoja Raj Basnet, and Arun Kumar Joshi, *Hybrid Wheat: Past, Present and Future*, 132 THEOR. APPL. GENET. 2463, 2463 (2019); Steve Mercer, *A Welcome Look at Hybrid Wheat Research*, U.S. WHEAT ASSOCIATES (May 17, 2018), <https://www.uswheat.org/wheatletter/a-welcome-look-at-hybrid-wheat-research/>. As far as replanting of non-hybrid seed is concerned, note that so-called “Terminator” seeds, containing Genetic Use Restriction Technology (GURT) that causes second-generation seeds to be sterile, have never been commercialized. *See* Genetic Literacy Project, *What’s the Controversy Over ‘Terminator’ Seeds?*, GMO FAQs, <https://gmo.geneticliteracyproject.org/FAQ/whats-controversy-gmos-terminator-seeds/> (last visited Dec. 11, 2019).

91. “Seed companies involved in research and development reinvest approximately 10[%] of sales into new innovations”; because new varieties take approximately eight years and between about \$1 million to \$7 million to develop “depending on the crop, and the cost of commercializing a new trait [is] estimated to be \$136 million over 13 years, companies have

farmers to consent to a specialized licensing agreement that does not permit saving and replanting.<sup>92</sup> These licenses are often called “bag tag” or “seed wrap” licenses because they are frequently displayed on seed bags.<sup>93</sup>

#### IV. *LEXMARK AND BOWMAN*

The Supreme Court has issued four decisions this century on patent exhaustion or the related concept of copyright first sale: first in 2008 for patents in *Quanta Computer, Inc. v. LG Electronics, Inc.*,<sup>94</sup> then in 2013 for copyright in *Kirtsaeng v. John Wiley & Sons, Inc.*,<sup>95</sup> then just shy of two months later for patents again in *Bowman*,<sup>96</sup> and most recently in 2017 for patents in *Lexmark*.<sup>97</sup>

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a financial responsibility to their shareholders and customers.” James Weatherly, *Can I Save That Seed?*, SEEDWORLD (Nov. 28, 2018), <https://seedworld.com/can-i-save-that-seed/>.

92. See Mark D. Janis, *Intellectual Property Issues in Plant Breeding and Plant Biotechnology*, ARTICLES BY MAURER FACULTY 2560 (2002), available at <http://www.repository.law.indiana.edu/facpub/2560>. For example, Monsanto/Bayer refers to its limited use seed license it provides as a “Technology Stewardship Agreement.” See Bayer, *2019 U.S. Tech. Use Guide and Insect Resistance Mgmt. Overview*, TECH. USE GUIDE AND INSECT RESISTANT MGMT. OVERVIEW: DOWNLOADS 1, 62, <http://tug.monsanto.com/> (last visited Dec. 11, 2019). These detail rules for how the seeds are to be used, including that the grower must: only acquire Monsanto seed from authorized companies; pay royalties and technology fees; use the seed in only “a single planting” and not save it for-replanting; not transfer the seed for planting or export; not plant seed for production without a license; and not plant seed for breeding or research purposes. *Id.* The Agreement at issue in *Bowman* was similar, see *Bowman v. Monsanto Co.*, 569 U.S. 278, 281 (2013), and listed the relevant patents. See *Monsanto Co. v. Bowman*, 657 F.3d 1341, 1349 (Fed. Cir. 2011). Monsanto had also told *Bowman* that, per the Agreement, “[p]lanting of seed that is covered by a patent would be making the patented invention and using the patented invention,” and thereby infringe. *Id.* (alteration in original) (citation omitted).

93. See Janis, *supra* note 92. Interestingly, there has been a recent push for “open source seed” license. See Johannes Kotschi & Bernd Horneburg, *The Open Source Seed Licence: A novel approach to safeguarding access to plant germplasm*, 16 PLOS BIOL. e3000023 (Oct. 23, 2018), <https://doi.org/10.1371/journal.pbio.3000023>. Currently, a small handful of seed products are available under such licenses in Europe, but it remains to be seen how widespread this practice will become. See *id.*; see also Jack Kloppenburg, *Re-Purposing the Master’s Tools: The Open Source Seed Initiative and the Struggle for Seed Sovereignty*, Food Sovereignty: A Critical Dialogue Conference Paper #56 (2013), <https://dces.wisc.edu/wp-content/uploads/sites/128/2013/08/2013-Repurposing.pdf>.

94. *Quanta Computer, Inc. v. LG Elecs., Inc.*, 553 U.S. 617 (2008).

95. See *Kirtsaeng v. John Wiley & Sons, Inc.*, 568 U.S. 519 (2013).

96. See *Bowman v. Monsanto Co.*, 569 U.S. 278, 284 (2013).

97. See *Impression Prods. v. Lexmark Int’l, Inc.*, 137 S. Ct. 1523, 1526 (2017).

A. A BRIEF SUMMARY OF EXHAUSTION JURISPRUDENCE PRE-*BOWMAN*

The Supreme Court did not touch exhaustion for sixty-six years, between *Univis*<sup>98</sup> in 1942 and *Quanta*<sup>99</sup> in 2008. In *Univis*, the Court held that exhaustion prevents a patentee from using an infringement suit to “control the resale price of patented articles which he has sold,”<sup>100</sup> because exhaustion “applies when the item sufficiently embodies the patent . . . such that its only and intended use is to be finished under the terms of the patent.”<sup>101</sup> In *Quanta*, the Court held that exhaustion can apply to method claims,<sup>102</sup> and that sales authorized in a licensing agreement invoke exhaustion.<sup>103</sup>

In the meantime, the Federal Circuit built its own scheme for exhaustion and single-use restrictions (later to be rejected by the Supreme Court<sup>104</sup>) in *Mallinckrodt*.<sup>105</sup> In that case, the accused infringement consisted of disobeying a single-use restriction that accompanied the sale of a patented item; the court held that “[u]se in violation of a valid restriction may be remedied under the patent law,”<sup>106</sup> meaning that patentees “could circumvent exhaustion . . . .”<sup>107</sup>

In 2013, the Supreme Court again took up the concept of exhaustion in *Kirtsaeng*,<sup>108</sup> which, even though the case is about copyright first sale and not patent exhaustion, delves into their shared common law origins.<sup>109</sup> In *Kirtsaeng*, the “Court held that the first sale doctrine applies to copies of works made and sold abroad.”<sup>110</sup>

B. *BOWMAN V. MONSANTO*

Eight weeks after issuing *Kirtsaeng*,<sup>111</sup> the Court issued its decision in *Bowman*, again wading into the topic of exhaustion, albeit narrowly.<sup>112</sup> Justice

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

99. *Quanta*, 553 U.S. 617 (2008).

100. *Univis*, 316 U.S. at 250.

101. *Quanta*, 553 U.S. at 628.

102. *Id.* at 629–30.

103. *Id.* at 637.

104. *See generally* Kobak, Jr., *supra* note 18.

105. *Mallinckrodt, Inc. v. Medipart, Inc.*, 976 F.2d 700 (Fed. Cir. 1992).

106. *Id.* at 701.

107. Kobak, Jr., *supra* note 18, at 609.

108. *Kirtsaeng v. John Wiley & Sons, Inc.*, 568 U.S. 519 (2013).

109. *See* *Impression Prods. v. Lexmark Int’l, Inc.*, 137 S. Ct. 1523, 1526 (2017).

110. *Id.* at 1527.

111. *Kirtsaeng*, 568 U.S. 519 (decided Mar. 19, 2013).

112. *Bowman v. Monsanto Co.*, 569 U.S. 278 (decided May 13, 2013).

Kagan delivered the unanimous *Bowman* opinion,<sup>113</sup> which relies on *Univis*<sup>114</sup> and *Quanta*,<sup>115</sup> but cites neither *Mallinckrodt* nor *Kirtsaeng*.

Previously, when *Bowman* had reached the Federal Circuit, it was the next case in a narrow line of cases about disputes between Monsanto and farmers over Monsanto's patented "Roundup Ready®"<sup>116</sup> herbicide resistant seeds,<sup>117</sup> and, "in each case, the Federal Circuit found for Monsanto and against the farmer,"<sup>118</sup> but the Supreme Court had not yet weighed in.

The facts of *Bowman* are similar to those of *McFarling* and *Scruggs*;<sup>119</sup> here, Indiana farmer Vernon Bowman replanted "Roundup Ready®" soybeans for eight seasons<sup>120</sup> before Monsanto sued him for patent infringement.<sup>121</sup> The license permitted Bowman "to plant the purchased seeds in one (and only one) season."<sup>122</sup> After that season, the license permitted him to "consume the

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113. *Id.* at 279.

114. *See id.* at 283–5.

115. *See id.* at 283.

116. "Roundup Ready" is Monsanto's (now Bayer's) trademark for its genetically engineered seeds that are resistant to the herbicide glyphosate. *See* Bayer, *History of Excellence*, ROUNDUP READY PLUS, <http://www.roundupreadyplus.com/platform/history> (last visited Dec. 11, 2019).

117. *See* *Monsanto Co. v. Scruggs*, 459 F.3d 1328 (Fed. Cir. 2006); *Monsanto Co. v. McFarling*, 363 F.3d 1336 (Fed. Cir. 2004) [hereinafter *McFarling II*]; *Monsanto Co. v. McFarling*, 302 F.3d 1291 (Fed. Cir. 2002) [hereinafter *McFarling I*].

118. Jeremy N. Sheff, *Self-Replicating Technologies*, 16 STAN. TECH. L. REV. 229, 231 (2013). In the *McFarling* cases, Monsanto sued a farmer for patent infringement for replanting saved seed in violation of the licensing agreement. *McFarling II*, 363 F.3d at 1339. The court noted that only the first-generation of seeds was licensed, and that creating the saved seed constituted making a patented good, which exhaustion does not cover. *Id.* at 1343. Furthermore, exhaustion could not apply to the second-generation seeds because the patentee had never sold them. *McFarling I*, 302 F.3d at 1299. In *Scruggs*, farmers purchased Monsanto seeds from a Monsanto-licensed seed seller, planted them without signing a licensing agreement, and then saved and replanted subsequent generations. 459 F.3d at 1333. Monsanto sued them for patent infringement, and the court found that the farmers lacked both actual *and implied* licenses. *Id.* at 1336. The court also held that exhaustion did not apply, because "the new seeds . . . had never been sold." *Id.* The court then took a stance on self-reproducing technologies more broadly, stating that "[t]he fact that a patented technology can replicate itself does not give a purchaser the right to use replicated copies of the technology," and that, if exhaustion applied "to subsequent generations of self-replicating technology[, it] would eviscerate the rights of the patent holder." *Id.*

119. *See supra* note 118 (summarizing the *McFarling* and *Scruggs* cases).

120. *Bowman v. Monsanto Co.*, 569 U.S. 278, 282 (2013).

121. The patents at issue cover particular, genetically-engineered genes and DNA sequences, plant cells comprising those genes or sequences, plants comprising those cells, seeds produced by those plants, and a method for using glyphosate on those seeds or plants. *Monsanto Co. v. Bowman*, 657 F.3d 1341, 1343–44 (Fed. Cir. 2011).

122. *Bowman*, 569 U.S. at 281.

resulting crop or sell it as a commodity,” but not to save seeds for replanting.<sup>123</sup> Bowman, who planted twice a year, followed these restrictions every year for his first harvest, but not for his second.<sup>124</sup> For his second harvests, he purchased commodity soybeans<sup>125</sup> from a grain elevator, planted them, applied Roundup® weed killer to select for “Roundup Ready®” plants, and then saved and replanted that seed.<sup>126</sup>

Bowman argued that patent exhaustion absolved him of infringement.<sup>127</sup> The district court, the Federal Circuit, and the Supreme Court, however, did not agree.<sup>128</sup> The Federal Circuit held that exhaustion did not permit Bowman to “‘replicate’ Monsanto’s patented technology by planting it in the ground to create *newly infringing* genetic material, seeds, and plants.”<sup>129</sup>

The Supreme Court affirmed, reasoning that growing more seed from purchased seed is properly categorized as *making a new copy of a patented item*, rather than simply *using a purchased item*.<sup>130</sup> The Court emphasized that exhaustion “restricts a patentee’s rights *only as to the particular article sold*; it leaves untouched the patentee’s ability to prevent a buyer from *making new copies . . .*”<sup>131</sup> Thus, exhaustion would allow Bowman to “resell the patented soybeans he purchased[,] . . . consume the beans himself or feed them to his animals”<sup>132</sup> without infringing, but not replant saved seed.<sup>133</sup>

The Court noted that if it were to have held for Bowman, Monsanto would be deprived of a fair reward for its invention.<sup>134</sup> The Court also explained that a holding for Bowman would have collapsed the heightened protections available through patents compared to PVP certificates, which would contradict the structure the Court specifically endorsed in *J.E.M. Ag Supply*.<sup>135</sup> Finally, the Court rejected Bowman’s so-called “blame-the-bean” defense,<sup>136</sup>

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123. Nor did it permit him to “supply them to anyone else for that purpose.” *Id.* at 281.

124. *Id.* at 281–82.

125. Which are intended only for consumption, not planting.

126. *Bowman*, 569 U.S. at 281–82.

127. This was because “the soybeans . . . were the subject of a prior authorized sale (from local farmers to the grain elevator).” *Id.* at 283.

128. *Id.*

129. *Monsanto Co. v. Bowman*, 657 F.3d 1341, 1348 (Fed. Cir. 2011) (emphasis added).

130. *See Bowman*, 569 U.S. at 287.

131. *Id.* at 284 (emphases added) (internal quotation marks and citations omitted).

132. *Id.* at 284.

133. *Id.* at 284–85.

134. *Id.* at 285–86.

135. *Id.* at 286.

136. Bowman argued that because “soybeans naturally self-replicate[,] . . . it was the planted soybean, not Bowman himself, that made replicas of Monsanto’s patented invention.” *Id.* at 288 (internal quotations and citation removed).

emphasizing that “Bowman was not a passive observer of his soybeans’ multiplication,”<sup>137</sup> but rather undertook a long list of active steps to “harvest crops from Roundup Ready seeds without paying the usual premium.”<sup>138</sup>

Critically, however, the Court was clear that the *Bowman* holding was narrow, “addressing the situation before us, rather than every one involving a self-replicating product.”<sup>139</sup> Exhaustion, the Court reiterated, “provides no haven for [] conduct”<sup>140</sup> intended “solely to make and market replicas . . . .”<sup>141</sup> But it explicitly left open two questions about self-reproducing technologies, declining to answer “whether or how the doctrine of patent exhaustion would apply” in other cases in which (1) “the article’s self-replication might occur outside the purchaser’s control” or (2) the article’s self-replication “might be a necessary but incidental step in using the item for another purpose.”<sup>142</sup>

*Bowman* thus clarified that, at least for the facts before it, exhaustion only applies to the first iteration of use of any particular self-replicating product sold. When Bowman created and then used subsequent generations of seed, he was operating outside the realm of exhaustion: his actions to “make” these new generations reached beyond the tangible object he purchased, and necessarily implicated the knowledge from Monsanto’s patent about the Roundup Ready® trait.<sup>143</sup> In a way, exhaustion itself exhausts after one generation of replication, such that acts that freshly implicate the patented knowledge constitute new, unexhausted infringement.<sup>144</sup>

*Bowman*’s exhaustion is more like “quasi”-exhaustion, prohibiting uses that implicate patented knowledge even when exhaustion otherwise applies.

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137. *Id.*

138. *Id.* at 288–89.

139. *Id.* at 289.

140. *Id.*

141. *Id.*

142. *Bowman v. Monsanto Co.*, 569 U.S. 278, 289 (2013).

143. *See id.* at 285 (listing Bowman’s affirmative acts to save and replant seed).

144. This explains why the Court noted that the seeds were exhausted *as to particular uses*. *Id.* at 284 (noting that exhaustion did not prevent Bowman from reselling, eating, or feeding the grain elevator seeds to animals). Such use-acts do not require the patented knowledge. But exhaustion did cover “uses” involving “making,” *id.* at 284–85 (“the exhaustion doctrine does not enable Bowman to make additional patented soybeans without Monsanto’s permission”), because the “making” that Bowman conducted necessarily implicated the patented knowledge. The Court did not state that in so many words, but its description of Bowman’s “making” actions, *id.* at 285 (“He took the soybeans he purchased home; planted them in his fields at the time he thought best; applied glyphosate to kill weeds (as well as any soy plants lacking the Roundup Ready trait); and finally harvested more (many more) beans than he started with.”) (emphasis added), clearly points out how the application of glyphosate was crucial to the process. Seeds would not be planted and grown this way without knowledge of Monsanto’s proprietary Roundup Ready® technology.

Conversely, there is some degree of permissible “making,” as far as patented DNA is concerned: genetic material will inherently reproduce even in authorized single plantings as the seeds germinate and resulting plants grow.<sup>145</sup> But *Bowman*’s exhaustion compromise makes sense. Other options would be the extremes of either making exhaustion completely unavailable for seeds or absolving all generations after the first sold seed from possibly infringing. But those alternatives constitute an unfairly arbitrary carve-out in the case of the former, or are economically perverse in the case of the latter. Instead, *Bowman* splits the difference. And *Bowman* does not result in a bizarre situation in modern industrial agriculture. The patent-derived need to purchase seed anew each season mirrors how the hybrid seed market, with its biologically-driven prohibition against replanting seeds, has functioned for a century,<sup>146</sup> showing that “use” and “making” of seeds can be meaningfully decoupled without restraining farmers from alienating themselves from their chattels.<sup>147</sup>

C. *IMPRESSION PRODS. V. LEXMARK INT’L, INC.*

The Supreme Court’s next exhaustion case was *Lexmark*. Chief Justice Roberts delivered the majority opinion,<sup>148</sup> which references *Univis*,<sup>149</sup> *Quanta*,<sup>150</sup> and *Kirtsaeng*,<sup>151</sup> but, curiously, not *Bowman*.<sup>152</sup> *Lexmark* was not about self-replication, but about refilling and reselling printer cartridges.<sup>153</sup> *Lexmark*

145. Perhaps uncoincidentally, limited permission for such “micro-makings” (if you will) is implicitly granted by the seed’s licensing agreement, which typically permits crop production and sale (but not replanting saved seed, breeding, or research). See *supra* at note 92 (explaining the content of a licensing agreement).

146. See *supra* text accompanying notes 77–89 (summarizing the hybrid seed market).

147. See *Bowman*, 569 U.S. at 288 (noting that “nonreplicating use of [] commodity beans”—that is, for consumption—is “not just available, but standard fare. And in the more ordinary case, when a farmer purchases Roundup Ready seed *qua* seed—that is, seed intended to grow a crop—he will be able to plant it.”) (alteration in original).

148. The decision was issued almost exactly four years after *Bowman*, on May 30, 2017. Justices Kennedy, Thomas, Breyer, Alito, Sotomayor, and Kagan joined; Justice Ginsburg concurred in part and dissented in part, and Justice Gorsuch did not take part. *Impression Prods. v. Lexmark Int’l, Inc.*, 137 S. Ct. 1523, 28 (2017).

149. See, e.g., *id.* at 1531.

150. See, e.g., *id.*

151. See, e.g., *id.* at 1532.

152. However, CropLife International, a trade association whose membership includes Monsanto and many other large seed companies, did write an amicus brief in support of *Lexmark*. See Brief of Amici Curiae Biotechnology Innovation Organization and CropLife International in Support of Respondent at 1, *Lexmark*, 137 S. Ct. 1523 (No. 15-1189), available at [https://www.scotusblog.com/wp-content/uploads/2017/03/15-1189\\_amicus\\_resp\\_biotechnology\\_innovation\\_organization.pdf](https://www.scotusblog.com/wp-content/uploads/2017/03/15-1189_amicus_resp_biotechnology_innovation_organization.pdf).

153. *Lexmark*, 137 S. Ct. at 1529.

“designs, manufactures, and sells toner cartridges,”<sup>154</sup> on which it owns several patents.<sup>155</sup> To encourage customers to return (rather than refill and reuse) the cartridges, Lexmark created a “Return Program” that offered cartridges at a reduced price—but with contractual single-use/no sale restrictions.<sup>156</sup>

Despite these contracts, a number of “remanufacturer” companies acquired empty cartridges, refilled them, and resold them.<sup>157</sup> The remanufacturers also imported cartridges they had acquired abroad and resold them in the United States.<sup>158</sup> When Lexmark got wind of this, they sued the remanufacturers for patent infringement.<sup>159</sup>

Lexmark argued that the remanufacturers infringed its patents by (1) refurbishing and reselling the “Return Program cartridges that Lexmark sold within the United States”,<sup>160</sup> and (2) importing, without authority, cartridges that Lexmark sold overseas.<sup>161</sup> The remanufacturers countered that their actions were shielded from infringement because “Lexmark’s sales, both in the United States and abroad, exhausted its patent rights in the cartridges . . . .”<sup>162</sup>

The Federal Circuit found no exhaustion<sup>163</sup>—but the Supreme Court reversed.<sup>164</sup> The Court said the Federal Circuit “got off on the wrong foot”<sup>165</sup> by framing exhaustion as “a presumption about the authority that comes along with a sale [rather than] a limit on the scope of the *patentee’s rights*.”<sup>166</sup> The

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154. *Id.*

155. *Id.*

156. Specifically, the contract required customers to agree to use the cartridge “only once and to refrain from transferring the empty cartridge to anyone but Lexmark.” *Id.* at 1530.

157. *Id.* at 1529.

158. *Id.* at 1530.

159. *Id.*

160. Lexmark justified this by the Return Program’s express prohibition on “reuse and resale.” *Id.*

161. *Id.*

162. *Id.*

163. *Id.* For Lexmark’s first point, the Federal Circuit relied on its own precedent from *Mallinckrodt* that violations of single-use/no-resale restrictions that are themselves “lawful and clearly communicated to the purchaser” are enforceable under patent law as “infringing conduct . . . .” *Lexmark Int’l, Inc. v. Impression Prods.*, 816 F.3d 721, 726 (Fed. Cir. 2016). The court reasoned that exhaustion did *not* apply because “a patentee’s decision to sell an item ‘presumptively grant[s] ‘authority’ to the purchaser to use it and resell it.’ But . . . the patentee does not have to hand over the full ‘bundle of rights’ every time.” *Impression Prods. v. Lexmark Int’l, Inc.*, 137 S. Ct. 1523, 1533–54 (2017) (quoting *Lexmark*, 816 F.3d at 741–42) (emphasis in original). Similarly, the Court held that “foreign sale[s] do[] not trigger patent exhaustion unless the patentee expressly or implicitly transfers or licenses its rights.” *Id.* at 1535 (citations omitted) (internal quotation marks omitted).

164. It also remanded. *See id.* at 1538.

165. *Id.* at 1533.

166. *Id.* at 1534 (citations omitted) (internal quotation marks omitted).

single-use restrictions “may have been clear and enforceable under contract law, but”<sup>167</sup> were not under patent law; the Court held that “Lexmark exhausted its patent rights in these cartridges *the moment it sold them.*”<sup>168</sup> Regarding the overseas sales, the Court held that “[a]n authorized sale outside the United States, just as one within the United States, exhausts all [patent] rights.”<sup>169</sup>

In its reasoning, the Court did cite a string of its own precedent on the application of exhaustion,<sup>170</sup> but mostly moved past the details of particular fact patterns and took a deep dive into dissecting the theory of exhaustion, laying bare its inner workings. The Court leaned heavily on “the common law principle against restraints on alienation,”<sup>171</sup> going back to Lord Coke in the seventeenth century.<sup>172</sup> Translating this to the modern day, the Court used a theoretical “illustration” of a used car shop to stress that the “smooth flow of commerce would sputter if companies that make the thousands of parts that go into a vehicle could keep their patent rights after the first sale.”<sup>173</sup>

The Court explained that exhaustion takes place upon *sale* because a sale fulfills patent law’s purpose of ensuring that “the patentee has received his reward for the use of his invention . . . .”<sup>174</sup> Once that “reward” transfers, there remains “no basis for restraining the use and enjoyment of the thing sold.”<sup>175</sup> Contrasting sales and licenses, the Court explained that exhaustion is concerned with the passing of title on tangible goods, whereas licensing “is about changing the contours of the patentee’s monopoly . . . .”<sup>176</sup> As far as sales by licensees are concerned, “if a patentee has not given authority for a licensee to make a sale, that sale cannot exhaust the patentee’s rights.”<sup>177</sup>

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167. *Id.* at 1531.

168. *Id.* (emphasis added). Justice Ginsburg concurred on this point. *Lexmark*, 137 S. Ct. at 1538 (Ginsburg, J., concurring in part and dissenting in part).

169. *Id.* at 1535. The Court noted that “[t]his question about international exhaustion of intellectual property rights has also arisen in the context of copyright law,” referring to *Kirtsaeng*. *Id.* at 1535–36. The Court revisited its reasoning from that case to conclude that “[a]pplying patent exhaustion to foreign sales is just as straightforward.” *Id.* at 1536. Justice Ginsburg dissented on this point and would have found no exhaustion of U.S. patent rights upon foreign sales. *Id.* at 1538 (Ginsburg, J., concurring in part and dissenting in part).

170. *See Id.* at 1531–33, 1537–38.

171. *Id.* at 1531, 1538.

172. *Id.* at 1532.

173. *Id.*

174. *Id.* (citations omitted) (internal quotations marks omitted).

175. *Id.* (citations omitted) (internal quotations marks omitted).

176. *Id.* at 1534 (citations omitted). This makes perfect sense when you consider that patents are drawn to intangible knowledge. *See* Syed, *supra* note 30, at 9.

177. *Lexmark*, 137 S. Ct. at 1535.

Where does that leave Lexmark and others who want to impose post-sale restrictions? According to the Court, there is

only one answer: Lexmark cannot bring a patent infringement suit . . . to enforce the single-use/no-resale provision . . . . Once sold, the . . . cartridges passed outside of the patent monopoly, and whatever rights Lexmark retained are a matter of the contracts with its purchasers, not the patent law.<sup>178</sup>

In sum, “[e]xhaustion does not depend on whether the patentee receives a premium for selling in the United States, or the type of rights that buyers expect to receive . . . . [R]estrictions and location are irrelevant; what matters is the patentee’s decision to make a sale.”<sup>179</sup> Exhaustion is not about “dealings between the parties, which can be addressed through contract law.”<sup>180</sup> Rather, it is about the principle of what a sale is: that the patentee has decided “to give up title to an item in exchange for payment.”<sup>181</sup> In what is perhaps simultaneously the most colorful, succinct, and useful summary of the entire decision, the Court concluded that “[a]llowing patent rights to stick remora-like to that item as it flows through the market would violate the principle against restraints on alienation.”<sup>182</sup>

Interestingly, by dismissing the importance of a “premium” for the patentee as a basis for exhaustion, the Court implicitly clarified its own opinion from four years earlier in *Bowman*. *Bowman* did not clearly articulate the difference between (1) whether the sale price of an item provides fair compensation to the patentee in a given market and (2) why exhaustion does not apply to newly-made items.<sup>183</sup> *Lexmark* clarifies that the point is “that the patentee receives one reward—of whatever amount the patentee deems to be ‘satisfactory compensation,’—for every item that passes outside the scope of the patent monopoly,”<sup>184</sup> not that the patentee should be “guarantee[d] a

178. *Id.* at 1533.

179. *Id.* at 1538.

180. *Id.*

181. *Lexmark*, 137 S. Ct. at 1538. The U.C.C. defines “sale” as “the passing of title from the seller to the buyer for a price.” U.C.C. § 2-106(1) (AM. LAW INST. & UNIF. LAW COMM’N 2019).

182. *Id.* A remora is a type of fish that uses a suction cup on its head to attach to sharks and other larger sea creatures. Their attachment mechanism is so strong that they “stay attached as water rushes past them [and] can even hold tight as their hosts try to scrape them off on rocks.” Carl Zimmer, *What Good Is Half a Sucker?*, NAT. GEO. (July 17, 2013), <https://www.nationalgeographic.com/science/phenomena/2013/07/17/what-good-is-half-a-sucker/#close>.

183. *See* *Bowman v. Monsanto Co.*, 569 U.S. 278, 285–86 (2013).

184. *Lexmark*, 137 S. Ct. at 1537 (quoting *Keeler v. Standard Folding Bed Co.*, 157 U.S. 659, 661 (1895)).

particular price . . . .”<sup>185</sup> Items exit the scope of the patent monopoly when they are sold (thus removing restraints on the purchaser’s ability to later alienate the item), not by whether the patentee ultimately makes a profit in a given market.<sup>186</sup>

Preliminary data imply that the success rate of exhaustion defenses may be dropping post-*Lexmark*.<sup>187</sup> But given the pace of litigation, there are still too few cases to measure *Lexmark*’s impact with statistical significance.<sup>188</sup> It will be interesting for future scholars to investigate whether exhaustion defenses are more, less, or equally popular and effective in a post-*Lexmark* world.

Scholars and practitioners have criticized *Lexmark* for imprecision and lack of guidance.<sup>189</sup> Although *Lexmark* provided a welcome dissection of precisely what patent exhaustion means, it failed to provide a clear path forward for patentees to determine if their “licenses” might be construed as “sales,” or whether there remains a viable way to limit downstream use and resale.<sup>190</sup>

Shubha Ghosh and Irene Calboli take issue with what they see as a “confounding” and overly-broad “misstatement” in the Court’s announcement that “[a] patentee’s decision to sell a product exhausts *all* of its

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185. *Id.*

186. *See id.* at 1531.

187. *Lexmark* was decided on May 30, 2017. *Lexmark*, 137 S. Ct. at 1523. According to data from darts-ip collected on October 12, 2019, exhaustion defenses were accepted in forty-five percent of patent infringement cases in the United States between May 30, 2010, and May 29, 2017, versus in eighteen percent of cases between May 31, 2017, and October 12, 2019 (when the author ran the search). However, the sample sizes—especially for the post-*Lexmark* set—are quite small, representing only seventy-six and eleven total cases in which exhaustion was argued before and after *Lexmark*, respectively. Unsurprisingly, the difference between these proportions is insignificant at  $p < 0.05$  when evaluated using Fisher’s Exact Test (test statistic value: 0.1138). Thus, there is a low likelihood that the two populations (of cases before versus after *Lexmark*) are significantly different. The author performed the Fisher’s Exact Test on the above data from darts-ip using a free online calculator provided by Social Science Statistics. *See* Jeremy Stangroom, *Easy Fisher Exact Test Calculator*, SOC. SCI. STAT., <https://www.socscistatistics.com/tests/fisher/default2.aspx> (last visited Dec. 11, 2019).

188. This is according to a search run on darts-ip on October 12, 2019. The lack of significance is unsurprising given that, in the roughly two-and-a-half years between the *Lexmark* decision and when the author collected the data, there have only been eleven U.S. cases in which an exhaustion defense has been raised (based on the search on darts-ip).

189. *See infra* notes 190–193. For further critiques of *Lexmark*, see also Hye Jin Kim, *Avoiding Patent Exhaustion at Home and Abroad: Impression Products v. Lexmark International*, 33 BERKELEY TECH. L.J. 945, 963–80 (2018); Kobak, Jr., *supra* note 18, at 610.

190. Brian Kacedon & Kevin D. Rodkey, *The Aftermath of Impression Products v. Lexmark*, LAW360 (Nov. 13, 2017), <https://www.finnegan.com/en/insights/the-aftermath-of-impression-products-v-lexmark.html>.

patent rights.”<sup>191</sup> First, Ghosh and Calboli point out that “the act triggering exhaustion is *the actual sale*, not just simply the *decision*.”<sup>192</sup> Second, they stress that exhaustion does not exhaust “all” patent rights: it is limited to the particular copy that was sold, and does not traditionally apply to the right to make.<sup>193</sup> But their second point reflects a misunderstanding of the Court’s statement. The next three words of the quote, which Ghosh and Calboli omitted in their analysis, are crucial. What the Court actually said is that “[a] patentee’s decision to sell a product exhausts all of its patent rights *in that item . . .*”<sup>194</sup> And the opinion clarifies that the rights transferred by sale are only “the right to use, sell, or import,”<sup>195</sup> those being the rights associated with “ownership.”<sup>196</sup> Thus, the Court did not imply that the right to make is excused by exhaustion. While the use of the word “all” in that sentence is needlessly confusing, in proper context it is not incorrect.

#### D. WHY *BOWMAN* STILL STANDS, POST-*LEXMARK*

A superficial reading of *Lexmark* and *Bowman* might lead one to think that *Lexmark* overturned *Bowman*: they both involved single-use licenses and downstream actions by purchasers. But the *Bowman* Court found that exhaustion did not apply, whereas the *Lexmark* court did. Furthermore, *Bowman* emphasized the importance of the value of the patent to the patentee<sup>197</sup> in a way that *Lexmark* dismissed.<sup>198</sup>

However, the actual decision in *Bowman* does not depend on the content of the agreements, whether one categorizes the accompanying transaction as a license or a sale, or the amount of sales profit to which the patentee may or may not be entitled. The point is that saved seeds and their progeny cannot be exhausted because they were never sold by the patentee; *they were made* by the farmer. Furthermore, *Bowman*’s act of “making” depended on the patented knowledge of the function of the Roundup Ready® trait. He knew he could

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191. Shubha Ghosh & Irene Calboli, EXHAUSTING INTELLECTUAL PROPERTY RIGHTS: A COMPARATIVE LAW AND POLICY ANALYSIS 101 (2018) (quoting *Lexmark*, 137 S. Ct. at 1529) (emphasis in original).

192. *Id.* (emphasis added).

193. *Id.*

194. *Lexmark*, 137 S. Ct. at 1529 (emphasis added).

195. *Id.* at 1534.

196. *Id.*

197. See Daryl Lim, *Argibiotech Patents in the Food Supply Chain: A U.S. Perspective*, GLOBAL FOOD VALUE CHAINS AND COMPETITION LAW, 8 (Ioannis Lianos, Alexey Ivanov & Dennis Davis eds., 2018) (stating that “the heart of *Bowman* was the policy concern that patent protection had to protect Monsanto’s innovation-linked investment and expense”) (citing *Bowman v. Monsanto Co.*, 569 U.S. 278, 285–89 (2013)).

198. See *Lexmark*, 137 S. Ct. at 1538.

obtain only Roundup Ready® plants from mixed commodity seed *because only Roundup Ready® plants in the mix would survive* herbicide application.<sup>199</sup>

Exhaustion boils down to a rejection of restraints on alienation of chattels,<sup>200</sup> but that only really makes sense when applied to chattels already in existence, even if they are self-replicating.<sup>201</sup> Thus, “‘a second creation’ of the patented item ‘call[s] the monopoly, conferred by the patent grant, into play for a second time.’”<sup>202</sup>

Daryl Lim suggests that, because of *Lexmark*, seed “sales” with use restrictions will be “contrary to federal patent exhaustion rules,” meaning that seed patentees who wish “to avoid triggering exhaustion must *avoid an authorized sale* through carefully structured licenses so that they retain control over subsequent uses by *stopping short of selling their goods*.”<sup>203</sup> However, he suggests a tension between *Bowman* and *Lexmark* that does not actually exist. Seed sales are still perfectly compatible with licenses on self-reproducing technologies. Even if a seed sale truly is an authorized “sale,”<sup>204</sup> an accompanying “license” is still valid post-*Lexmark* so long as that license does not claim to curtail uses contained to the particular set of seeds that were subject to the sale and/or uses that only incidentally implicate the patented knowledge. Even post-*Lexmark*, exhaustion does not apply to *new copies* of the invention or to uses of any copy that *more than incidentally implicate the patented knowledge*. Indeed, this is precisely what “seed wrap” licenses typically cover.<sup>205</sup>

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199. See *Bowman*, 569 U.S. at 282. Dissection of “making” in this manner—by focusing on the implicated knowledge space, see Syed, *supra* note 30, at 10–11, sidesteps the dictionary-driven approach that Justice Kagan deploys in the *Bowman* opinion. See 569 U.S. at 285 (quoting Webster’s Dictionary for “how to ‘make’ a new product . . . when the original product is a seed”) (internal quotations marks and citation removed). The literalist approach is only of limited use, as it is inherently limited by the space a dictionary editor chooses to devote to a given word. That being said, the *Bowman* opinion’s analysis does not actually hang on the dictionary and, like *Lexmark*, is primarily driven by policy. See, e.g., 569 U.S. at 283–84 (discussing the goals of the exhaustion doctrine as developed by classic Supreme Court case law).

200. See *Lexmark*, 137 S. Ct. at 1532 (quoting *Kirtsaeng v. John Wiley & Sons, Inc.*, 568 U.S. 519, 538 (2013)).

201. For example, there is no guarantee that any given seed will necessarily germinate and produce future generations of seeds. See Knox, *supra* note 54. Thus, ownership of a given physical set of seeds does not necessarily mean ownership of their progeny, because there may not ever be progeny.

202. *Bowman*, 569 U.S. at 284 (alteration in original) (quoting *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 365 U.S. 336, 346, (1961)).

203. Lim, *supra* note 197, at 19–20 (emphases added).

204. Including, as he puts it, “dispossession of the seeds” that “indicate[s] that the companies intended the seeds be sold through a physical transfer of with no intention of return, indicating a sale rather than a license.” Lim, *supra* note 197, at 19–20.

205. See Janis, *supra* notes 92–93.

Thus, the content of Monsanto's (or any company's) seed licenses merely fills in any gaps between the purchased physical group of starting seeds (which are themselves exhausted) and the patented underlying knowledge implicated in any "second creations" or "micro-makings"<sup>206</sup> involved in getting from that starting seed to certain permitted end products (such as a single year's crop). The seed licenses thus excuse from infringement defined and limited amounts of "making" that implicate that knowledge, such as the amount of DNA and cell replication necessary to grow a plant from a legitimately purchased seed under the farmer's stewardship. But other actions related to those freshly-made copies (such as Bowman's pipeline of selectively propagating Roundup Ready® seeds) remain unexhausted and unlicensed. *Bowman*, therefore, still stands post-*Lexmark*.

## V. BOWMAN'S OPEN QUESTIONS, POST-*LEXMARK*

The *Bowman* Court recognized that self-reproducing "inventions are becoming ever more prevalent, complex, and diverse,"<sup>207</sup> and are not necessarily limited to the seed market. It is not clear precisely what technologies they are alluding to here, but it is likely that they had in mind technologies such as engineered cell lines for expressing biopharmaceuticals,<sup>208</sup> vaccines,<sup>209</sup> or software that can be copied.<sup>210</sup> In any case, the Court was clear that the *Bowman* decision "is limited—addressing the situation before us"<sup>211</sup>—that is, a farmer knowingly and purposefully planting "patented soybeans solely to make and market replicas of them"<sup>212</sup> without authorization from the

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206. See *supra* note 145 and accompanying text.

207. *Bowman*, 569 U.S. at 289.

208. See Brief for the American Intellectual Property Law Association as Amicus Curiae in Support of Affirmance at 34–35, *Bowman v. Monsanto Co.*, 569 U.S. 278 (2013) (No. 11-796).

209. See Transcript of Oral Argument, *Bowman v. Monsanto Co.*, 569 U.S. 278 (2013) (No. 11-796).

210. See *id.* at 30. Relatedly, the Supreme Court recently denied certiorari in the Second Circuit's *Redigi* case, which involved the question of the application of the copyright first sale doctrine to digital files. See *Capitol Records, LLC v. ReDigi Inc.*, 910 F.3d 649 (2d Cir. 2018), *cert. denied*, *ReDigi Inc. v. Capitol Records, LLC*, 139 S. Ct. 2760 (2019). In that case, the Second Circuit affirmed the district court's holding that the defendant's platform, which transmitted a single digital copy of the purchased song to the purchaser while deleting the seller's original copy, "infringed the Plaintiffs' exclusive rights under 17 U.S.C. § 106(1) to reproduce their copyrighted works." *Id.* at 652–53.

211. *Bowman*, 569 U.S. at 289.

212. *Id.*

patentee—“rather than every [situation] involving a self-replicating product.”<sup>213</sup>

The Court then went out of its way to explicitly leave open “whether or how the doctrine of patent exhaustion would apply”<sup>214</sup> to self-reproducing technologies in two particular situations. The questions the Court leaves open here—described in more detail below—are vague, and the opinion declines to explain precisely what they might refer to.

*Lexmark* did not explicitly tackle any of *Bowman*’s questions. But unlike *Bowman*, *Lexmark* did not limit its holding, and spoke widely and clearly about its conception of patent exhaustion. Furthermore, as explained above, *Bowman*’s holding remains good law post-*Lexmark*. Thus, although these questions remain apparently open, I argue that *Bowman* and *Lexmark* between them provide all the tools necessary to derive answers to *Bowman*’s loose ends.

This Part unpacks *Bowman*’s open questions, lays out the “Bowmark” framework, applies that framework to answer whether and how exhaustion might apply in each situation, and finally evaluates whether that answer is acceptable or whether affirmative changes are needed to reach a different result.

#### A. WHAT QUESTIONS *BOWMAN* LEFT OPEN, AND HOW TO APPLY “BOWMARK” TO CLOSE THEM

What I refer to as “*Bowman*’s two questions” are “whether or how the doctrine of patent exhaustion would apply”<sup>215</sup> when an item’s self-reproduction (1) “occur[s] outside the purchaser’s control,”<sup>216</sup> or (2) is “a necessary but incidental step in using the item for another purpose.”<sup>217</sup>

Other scholars have suggested constructing novel paradigms to handle the types of questions that *Bowman* left open.<sup>218</sup> But no one has taken advantage of the Court’s recent clarity in *Lexmark* of how it conceives of exhaustion as a broad theory (as opposed to *Bowman*’s stubbornly limited holding) to revisit

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213. *Id.*

214. *Id.*

215. *Id.*

216. *Id.*

217. *Id.*

218. See Adanna Uwazurike, *Remaking Making: Integrating Self-Replicating Technologies with the Exhaustion Doctrine*, 59 B.C.L. REV. 389, 416–18 (2018) (summarizing “a number of proposed solutions to the problem of self-replicating technologies and the threat to innocent infringers,” such as “expanding the use of contract law or property law in the seed industry or applying copyright regimes”); see also *id.* at 418–421 (suggesting that the definition of “making” for infringement of self-replicating technologies be limited to acts of making in which the actor knowingly infringed).

these questions and finally provide conclusive, explicit answers.<sup>219</sup> I propose to do so, using the “Bowmark” framework to guide the analysis.

The application of Bowmark proceeds in two steps. First, it determines whether there is infringement: Is there an act that implicates the underlying intangible patented knowledge?<sup>220</sup> If not, there is no infringement, and thus no reason to dive into an exhaustion analysis. If there is infringement, the second step evaluates the situation through the lens of *Bowman* and *Lexmark*’s collective exhaustion themes.

The Bowmark guiding themes explain both *how* and *why* exhaustion is applied in the second step of the framework. The “hows” of exhaustion, according to Bowmark, are that: (1) exhaustion applies automatically upon authorized sale;<sup>221</sup> (2) sales are only “authorized” if they are conducted directly by the patentee or indirectly through a licensee in compliance with their license;<sup>222</sup> (3) exhaustion cuts off the patentee’s monopoly on “use,” “sale,” and “importation”<sup>223</sup> (but *not* on active “making” that requires use of the underlying patented knowledge);<sup>224</sup> (4) exhaustion applies separately and individually to each particular sold item;<sup>225</sup> and (5) parties cannot contract around exhaustion.<sup>226</sup>

*Bowman* and *Lexmark* list a variety of justifications for exhaustion,<sup>227</sup> but they are largely redundant. So “Bowmark” boils them down to just two:

219. Lim discusses *Bowman* post-*Lexmark* but does not fully address or unpack *Bowman*’s two open questions. See generally Lim, *supra* note 197, at 7–20; see also *infra* notes 252–253, 255 and accompanying text (discussing Lim’s analysis of *Bowman* in greater detail).

220. See Syed, *supra* note 30, at 8.

221. See *Impression Prods. v. Lexmark Int’l, Inc.*, 137 S. Ct. 1523, 1534–38, 1566 (2017) (stating that: restraints on alienation should be avoided; the patentee is entitled to only one “reward”—but not necessarily to the highest possible price—per item sold; the flow of commerce should not be impeded by “remora-like” patent rights; the doctrines of patent exhaustion and copyright first sale have the same, deep common law roots; exhaustion should be conceived as “a limit on the scope of the patentee’s rights”; licenses are about “exchanging rights,” whereas sales are about “passing title to a product”; “a license does not implicate the same concerns about restraints on alienation as a sale”; “only the patentee can decide” when to release an item from their use, sell, or import monopoly via exhaustion; and a sale authorized by the patentee is the affirmative manifestation of that decision) (internal quotations and citations removed); see also *Bowman v. Monsanto Co.*, 569 U.S. 278, 283–84 (2013).

222. See *Lexmark*, 137 S. Ct. at 1535.

223. See *id.* at 1534.

224. See *Bowman*, 569 U.S. at 288–89 (explaining that *Bowman* “was not a passive observer” and “controlled the reproduction” of the seeds in a way that actively utilized their patented trait).

225. See *Lexmark*, 137 S. Ct. at 1537; see *Bowman*, 569 U.S. at 283–84.

226. See *Lexmark*, 137 S. Ct. at 1538.

227. See *id.* at 1532.

(1) restraints on alienation of chattels should be avoided and (2) the patentee is entitled to only one “reward” per item sold.

B. QUESTION 1: SELF-REPLICATION OUTSIDE THE PURCHASER’S CONTROL

The first open question in *Bowman* is how exhaustion would be applied, if at all, when an item self-reproduces “outside the purchaser’s control.”<sup>228</sup> To what situations could this question apply? I have come up with three plausible scenarios, which I have termed “set it and forget it,” “wind,” and “already rolling.”<sup>229</sup> I will discuss each in turn below, applying the Bowmark framework to determine first if there is infringement, and then if there is exhaustion.

1. “Set It and Forget It”

Based on the oral arguments in *Bowman*, the Court may have had something along these lines in mind: a farmer obtains some amount of Monsanto seeds<sup>230</sup> and “throw[s] the seeds on the ground,”<sup>231</sup> exerting (for the sake of argument) no “control” over, and doing no further work towards, their subsequent germination or growth. Nevertheless, “one or two of the [seeds] . . . grow . . . [.]”<sup>232</sup> I will refer to this situation as “set it and forget it.”

The application of the Bowmark framework first asks if there is any direct infringement. The infringement analysis in this situation is straightforward and was actually addressed briefly during oral argument. Yes, the act of throwing seeds on the ground such that some of those seeds later sprout can constitute infringement if it implicates the underlying intangible patented knowledge.<sup>233</sup>

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228. *Bowman*, 569 U.S. at 289.

229. Note that, by shooting down *Bowman*’s “blame the bean” defense, the Court made it clear that they did *not* view this question to apply to a farmer applying routine levels of care towards their fields to usher new generations of crops into existence, when that care implicates patented knowledge. *See id.* at 288–89. As far as the Court is concerned, such a situation does represent “control” by the farmer, even if the farmer is not personally manipulating every cycle of DNA replication and every cell division. *See id.*

230. The scenarios posed in this and subsequent Sections use Monsanto as the hypothetical patentee, but note that the same analyses could apply to other entities holding patents on seeds, biotechnology, or other self-reproducing technology. These scenarios also all assume that the underlying patents are valid, and that every claimed element is present in the accused product or process.

231. Transcript of Oral Argument, *supra* note 209, at 12–13.

232. *Id.*

233. *See id.* at 13. Exactly how this act might implicate patented knowledge will depend on the particular patented trait(s) in question. Hypothetical traits for which a “set it and forget it” type act could implicate patented knowledge include drought resistance or growth patterns engineered to thrive unassisted in a particular soil composition. If the farmer has an assorted collection of seeds and knows that some have been engineered in such a way, then they could selectively propagate only the engineered ones merely by “tossing” them into an environment

It may not be the most efficient “use” of seeds, but it is still an act that uses the seeds without authority of the patentee (assuming no license) and could easily implicate underlying patented knowledge.<sup>234</sup> Does the act of throwing these seeds on the ground constitute unauthorized “making”? Yes, to the extent that the “use” of tossing the seeds implicates the patented knowledge and that the seeds’ landing on the ground initiates at least one round of replication of patented DNA.

The exhaustion analysis is similarly straightforward: if the initial seeds were the subject of an authorized sale, then they were exhausted, and the farmer’s seed-tossing “use” is excused from infringement. However, any subsequent iterations of the patented products, including DNA sequences, are not exhausted. Thus, any growth from the “tossed” seeds, when the farmer “tossed” them based on underlying patented knowledge, constitutes unexhausted infringement. This is not different from the outcome in *Bowman*.<sup>235</sup>

## 2. “Wind”

The Court also may have had in mind the “wind” scenario, which looks something like this: Farm 1 is growing Roundup Ready® plants from seed that was subject to a Monsanto-authorized sale. Wind blows some seed from Farm 1 onto the neighbor’s farm, Farm 2, which is only growing conventional (not genetically modified) seed and has no relationship with Monsanto. The seed from Farm 1 then grows on Farm 2.<sup>236</sup> Perhaps neither farmer is even aware of this wind-borne cross-contamination.<sup>237</sup>

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they know would not support unengineered seeds, exactly in the same way that *Bowman* applied glyphosate to kill off unengineered plants.

234. See *Bowman v. Monsanto Co.*, 569 U.S. 278, 282 (2013) (explaining that *Bowman* used the knowledge about glyphosate resistance from Monsanto’s patents to direct his infringing acts).

235. For example, the farmer might choose to “ignore” the seeds specifically because of knowledge of the trait; for instance, knowing that certain seeds are drought tolerant might lead the farmer to decide to conserve water and selectively only water other plants.

236. See Transcript of Oral Argument, *supra* note 209, at 38.

237. This “wind” scenario is a common demon in the public discourse surrounding Monsanto, though, contrary to popular belief, Monsanto has yet to sue a farmer for patent infringement based on inadvertent cross-contamination. See Dan Charles, *Top Five Myths Of Genetically Modified Seeds, Busted*, NATIONAL PUBLIC RADIO: THE SALT (Oct. 18, 2012), <https://www.npr.org/sections/thesalt/2012/10/18/163034053/top-five-myths-of-genetically-modified-seeds-busted>. The two closest cases to this situation are *Monsanto Can. Inc. v. Schmeiser*, [2014] S.C.R. 902 (Can.), and *Organic Seed Growers & Trade Ass’n v. Monsanto Co.*, 718 F.3d 1350 (Fed. Cir. 2013), *cert. denied*, 134 S. Ct. 901 (2014).

In the *Schmeiser* case, Monsanto sued a Canadian canola farmer who was found to be growing Roundup Ready® seed without a license. See *Schmeiser*, [2014] SCC at 912. In that

Applying Bowmark here is complicated by the presence of multiple parties. There is Farmer 1, who purchased the seeds, and Farmer 2, in whose field some of the seeds sprouted. Is there direct infringement? Assuming Farmer 2 is performing acts on their field that result in plant growth and implicate the patented knowledge,<sup>238</sup> then yes, Farmer 2's actions constitute direct infringement for the same reasons as in the "set it and forget it" scenario. But if the plants are just randomly growing in a field that Farmer 2 owns—maybe "Farmer 2" isn't even a farmer at all. Maybe they are just the next landowner over and couldn't tell soybeans from sugar beets; then perhaps there are no acts of direct infringement. In that scenario, we do not even reach the question of exhaustion.

If there is direct infringement, we may then also ask about indirect infringement, which could implicate Farmer 1's actions. In order to be liable for *inducing* Farmer 2's infringement, Farmer 1 must have (1) actively induced Farmer 2's infringement and (2) either known that Farmer 2's actions constituted infringement or been willfully blind thereto.<sup>239</sup> This could go either way, depending on the facts. If the two farms are very close to one another—say, directly abutting—and Farmer 1 knows that Farmer 2 does not grow Monsanto<sup>240</sup> seed, then it may be relevant whether, for example, Farmer 1's farming practices align with the stewardship practices put forth in Monsanto's Technology Use Guide for reducing cross-contamination.<sup>241</sup> If Farmer 1 is doing everything within reason to reduce pollen spread, yet it still occurs, then

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case, nearly all of Schmeiser's crop was found to be Roundup Ready®, indicating that, even if the initial seed had been blown in by a neighboring farm, Schmeiser went out of his way to select and propagate the plants embodying Monsanto's patents by spraying Roundup® weed killer and saving and replanting seed from the surviving plants. *See id.* at 912, 929. In that case, the Supreme Court of Canada found Schmeiser liable for patent infringement. *See id.* at 937.

In contrast, in *Organic Seed Growers*, a group of farmers and affiliates sued Monsanto with the aim of obtaining declaratory judgements that they could not be held liable for infringing Monsanto's patents for inadvertent contamination in their fields. *See Organic Seed Growers*, 718 F.3d at 1352. The district court dismissed the case for lack of case or controversy because Monsanto had "made binding assurances that it will not 'take legal action against growers whose crops might inadvertently contain traces of Monsanto biotech genes (because, for example, some transgenic seed or pollen blew onto the grower's land)' . . . ." *Id.* (citations omitted). The Federal Circuit affirmed. *See id.*

238. For example, maybe Farmer 2 knows that Farmer 1 next door is growing plants exhibiting a patented trait conferring resistance to a particular pest. Then, after a particularly windy planting, Farmer 2 decides to not apply their usual pesticide for that pest to the edge of their field that borders Farmer 1's field, knowing that any seed that blew over will not need it.

239. *See Glob.-Tech Appliances, Inc. v. SEB S.A.*, 563 U.S. 754, 766–71 (2011).

240. I am using "Monsanto" here as a stand-in for convenience, but the hypothetical would work equally well with any other entity selling patented seed.

241. *See Bayer, supra* note 92, at 13–14.

Farmer 1 will likely not be held to be an induced infringer. After all, even Monsanto's own Technology Use Guide acknowledges that "[i]t is generally recognized in the industry that a certain amount of incidental, trace level pollen movement occurs, and it is not possible to achieve 100% purity of seed or grain in any crop production system."<sup>242</sup>

But if Farmer 1's practices are unreasonable such that they likely knew or were at least willfully blind to the fact that Farmer 2's acts would infringe—maybe they told Farmer 2 all about how to use their special seeds, and then set up giant fans specifically to blow pollen into Farmer 2's fields (or, less wildly, maybe they merely sowed their seeds unreasonably close to the property line)—then it is possible that Farmer 1 will be liable for induced infringement.

Depending on how the patent claims are structured and what actions Farmer 2 takes, it is possible that Farmer 1 may also be liable for contributory infringement. Continuing from the situation above, perhaps Farmer 1 is aware that their farming practices spread a significant amount of seed into Farmer 2's field, and specifically into open containers of seed that Farmer 2 is about to plant. Furthermore, suppose the patents covering Farmer 1's seed contain a claim similar to claim 130 of U.S. Patent No. RE39,247E in *Bowman*, which covers a "method for selectively controlling weeds" comprising planting Roundup Ready® seeds in a field and spraying the field with Roundup® weed killer.<sup>243</sup> Finally, suppose that after Farmer 2 plants their seed, Farmer 1 mentions to them that they might get good results if they spray Roundup® weed killer, which Farmer 2 then does. In this scenario, Farmer 1 may be liable for contributory infringement for providing Farmer 2 with the seeds necessary to infringe that claim.

Having found infringement, the second step under the *Bowman* framework is whether or not patent rights have been exhausted. First, any seeds that Farmer 1 purchased with authorization from Monsanto are themselves exhausted. However, any subsequent generations—including "micro-makings" of patented items on the molecular and cellular scales—are not exhausted. Thus, any of the "wind" infringement events that involve seed or DNA copies that were not physically subject to an authorized sale are not exhausted. Those are newly infringing items, and, as such, would need to be the subject of an authorized sale or license to excuse their use or making from infringement.<sup>244</sup>

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242. *Id.* at 13.

243. *See* *Monsanto Co. v. Bowman*, 657 F.3d 1341, 1344 (Fed. Cir. 2011).

244. Indeed, Justice Breyer acknowledged this in the *Bowman* oral arguments. Counsel for *Bowman* categorized Monsanto's argument as "any cell division is patent infringement" regardless of how one obtains the seeds. Transcript of Oral Argument, *supra* note 209, at 13.

### 3. “Already Rolling”

Alternatively, “outside the purchaser’s control” could also encapsulate a hypothetical situation in which the self-replication was already underway at the time of the purchase, which I will refer to as “already rolling.” This is similar to the “wind” scenario in that more than one party is involved, but is further complicated by the element of time. In this situation, self-replication has already been set in motion when the authorized sale takes place.

For instance, imagine that a farmer purchases a field that is already growing a Roundup Ready® crop. At the time of sale, the field contains some seeds that have not sprouted, some immature first-generation plants, some mature first-generation plants that have begun to set seed, and some second-generation seed. This situation fits squarely into those described above: any physical embodiments of a patent that are already present in that field are immediately exhausted upon the sale, assuming the sale is authorized. Thus, any uses that are contained to the copies that existed at the time of sale are excused from infringement. In effect, the seller sold whatever generations existed in the freeze-frame of the time of sale, whether those generations were what one might think of as “whole” (containing fully-formed plants or seeds) or “partial” (imagine, say, an ovule in a mother plant’s flower that was in the process of being fertilized into a second generation at the split second that the sale went into effect). It may be easier to imagine the items implicated in this situation, not as individual “plants” or “seeds” per se, but as a distinct collection of cells containing a given number of copies of particular DNA sequences, frozen in time at the time of sale. Regardless, whatever existed at the time of sale is exhausted—and whatever grows thereafter is not, leaving the purchaser open to potential infringement liability.

However, any embodiments that come into existence after the sale—even immediately after the sale—are not themselves subject to an authorized sale.<sup>245</sup> And any subsequent acts that apply patented knowledge to tend to the newly-purchased field, when those acts usher additional copies into existence, are newly infringing acts of “making.” Because copies that came into existence after the sale are not themselves the subject of an authorized sale, they are not exhausted. Therefore, post-sale acts of farming that implicate the patented

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Justice Breyer then agreed, and suggested that, for the same reason, it “is just as much a violation” when someone “buys generation 1 from Monsanto . . . , [and] they plant it in the ground and lo and behold up comes generation 2 . . . . But I think . . . that [Monsanto’s] response [to] that is, yes, you’re right, it is just as much of a violation. That’s why we, Monsanto, give the buyer a license to do it.” *Id.* at 13–14.

245. This depends on the exact terms of the sale agreement.

knowledge, such as spraying Roundup® weed killer on the field, constitute unexhausted infringement by unauthorized “making.”

Interestingly, if there are any copies that come into existence during a gap between the sale and the onset of the purchaser’s acts of farming, then those copies<sup>246</sup> would not be derived from an infringing act.<sup>247</sup> This is similar to the version of the “wind” scenario in which Farmer 2 does nothing, and the seeds grow on their land anyway. Here, the purchaser similarly did not act on the new iterations. Thus, the generation of these “gap” copies does not constitute unauthorized “making,” so their existence does not represent infringement.

In contrast, subsequent “use” of these new copies that implicates the patented knowledge—regardless of whether the new copies were “made” by an infringing act—*does* constitute infringement. Furthermore, that infringement is not exhausted because these copies (“gap” or otherwise) were not the subjects of an authorized sale.

The field as a whole, then, might have several different infringement and non-infringement, and exhaustion and non-exhaustion, scenarios at play at once. Oddly, these various scenarios may all even be present in microcosm within a single plant, if that plant’s existence spanned the sale and the onset of the purchaser’s activities. Such a plant might end up being a chimera of at least the following situations: (1) cells and nucleic acids that existed before the sale, the purchaser’s unauthorized “use” of which does not implicate the patented knowledge but would be an infringing act but for the sale’s exhaustive effect; (2) same as (1), but the “use” *does* more than incidentally implicate the patented knowledge, so exhaustion does not apply; (3) cells and nucleic acids that came into existence during a gap between the sale and the onset of the purchaser’s acts, the purchaser’s patented-knowledge-implicative use of which constitutes unexhausted infringement; and (4) cells and nucleic acids whose existence is derived from the purchaser’s farming activities, the use *and* making of which, to the extent that they implicate patented knowledge, constitute infringement by the purchaser. Perhaps those distinctions would not be useful in practice, or perhaps they would be of some help during damages calculations. Either way, the point still stands that such a situation, bizarre as it may seem, can exist but is fully capable of dissection by the Bowmark framework.

Yet there is still more to this “already rolling” scenario: The seller’s actions, too, should be analyzed for infringement. Any of the above acts by the purchaser that constitute direct infringement could make the seller liable for

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246. Consider, say, the resulting DNA from cell divisions that were in progress at the time of sale.

247. This is only if there is such an actual gap, and not, say, a contractual instantaneous transfer of control over ongoing farming activities.

indirect infringement. This analysis is essentially the same as that for Farmer 1 in the above “wind” scenario, with the result being that the seller may very well be liable. For example, Monsanto’s limited use license specifies that if a licensed grower sells land containing its patented technology, the grower must notify the purchaser that (1) the contents of the field are subject to the limited use license with Monsanto and that (2) the purchaser “must have or obtain their own Monsanto Technology Stewardship Agreement to harvest or use, transfer or sell the harvested crop.”<sup>248</sup> This indicates that the seller is aware that the purchaser will need a license to avoid infringement for farming that field. Therefore, if the seller does *not* inform the purchaser that they need to obtain their own the licensing agreement, and the purchaser does not obtain a license and is thus found to infringe, then the seller may be liable for inducing and/or contributing to that infringement. Furthermore, if the seller did *not* give such requisite notice to the purchaser, then the sale would not be an *authorized* sale in the first place, since it did not comply with the terms of the seller’s own license. In this case, the seller would be liable for direct infringement (unauthorized selling) as well as the aforementioned indirect infringement. Further, absent an authorized sale, any infringement in the “already rolling” scenario would enjoy no exhaustion whatsoever.

#### 4. *Summary and Analysis of Question 1’s Answers*

Lim states that “[f]uture cases must clarify the role of intent.”<sup>249</sup> But application of *Bowmark* in the above situations shows that the case law we already have can dissect how unexhausted infringement might arise on the part of someone who may not consider themselves in “control” of a patented product’s self-replication. The facts may be complicated, but the equation is simple: Unauthorized acts of making, using, selling, and importing a patented item infringe when they implicate underlying patented knowledge, and exhaustion applies *only* to the closed set of physical copies that were subject to an authorized sale. Whether it is actually worth the patentee’s time, money, and effort to pursue litigation in any of the above situations does not change the underlying fact that many of them represent acts of unexhausted infringement.<sup>250</sup>

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248. Bayer, *supra* note 92, at 62 part 1(j).

249. See Lim, *supra* note 197, at 26.

250. For example, in the *Bowman* oral arguments, counsel for Monsanto stated that “[t]he point that there may be many farmers . . . that may have some inadvertent Roundup Ready [crops] in their fields may be true, although [] it is not well documented. There would be inadvertent infringement if the farmer was cultivating a patented crop, *but there would be no enforcement of that. The farmer wouldn’t know, Monsanto wouldn’t know, and in any event, the damages would be zero* because you would ask what the reasonable royalty would be, and if the farmer

Is this the “right” outcome, from a policy perspective? How “should” exhaustion work in the context of self-replication “outside the purchaser’s control?” Self-replication is still replication, meaning it still conjures a new embodiment of the patented knowledge into existence, one that was never subject to an authorized sale. By the policy embraced in *Lexmark*,<sup>251</sup> such an event is completely unrelated to exhaustion. Regarding the lack-of-control aspect, the results are still fair because infringement, as always, still demands the alleged infringer to have committed *an act* that implicates the patented knowledge.<sup>252</sup> Such an act results in infringement as soon as it intersects with even microscopic movements of the DNA-replicating enzymes as they physically execute and “control” the self-replication; the infringer never needs to know they were infringing in order to infringe.<sup>253</sup>

C. QUESTION 2: SELF-REPLICATION AS A NECESSARY BUT INCIDENTAL STEP TOWARDS ANOTHER PURPOSE

The second open question in *Bowman* is how exhaustion would be applied, if at all, when “the article’s self-replication . . . [is] a necessary but incidental step in using the item for another purpose.”<sup>254</sup> Lim reads this question as answering itself; he states that “the Court qualified that multiplication per se would not negate exhaustion since reproduction as an incidental and integral

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doesn’t want Roundup Ready technology and isn’t using Roundup Ready technology to save costs and increase productivity, [] the royalty value would be zero.” Transcript of Oral Argument, *supra* note 209, at 40–41 (emphasis added).

251. See *supra* note 221 (explaining the underlying policy of *Lexmark*).

252. Lim argues that “the better solution [is] for licensees to deal with these issues” rather than farmers, because “[a]gribiotech patentees and their immediate downstream licensees are most knowledgeable about the technology” and are better equipped to handle litigation. Lim, *supra* note 197, at 18. However, farmers who are growing crops from proprietary seeds (as opposed to using the seeds as commodities for feed) *are* themselves properly licensees, and infringement on the farmer’s part still boils down to the same basic principles as infringement by anyone else. Thus, it is not helpful to distinguish between “farmers” and “licensees” in terms of the infringement analysis.

253. *But cf.* Lim, *supra* note 197, at 17–18 (arguing that direct liability for farmers and seed companies “should not rest on knowledge. The better reading is for farmers to be found liable as active inducers of the patent infringement their though [*sic*] willful blindness or actively encouraging the [seed companies’ direct] infringement [of selling for uses outside the terms of their license]. . . . Farmers’ liability springs not from their knowledge of the restrictions, but the inducement of the company’s infringement,” and that it is better if “the burden rest[s] upon patentees and their licensees rather than farmers”). But Lim’s discussion of “knowledge” here confuses the issue, which is not about knowledge *of the infringement*, but use of the knowledge covered by the patent. See Syed, *supra* note 30, at 10–11. Farmers may or may not be “willfully blind” to the existence of a relevant patent while still directly infringing by using the knowledge covered by the patent.

254. *Bowman v. Monsanto Co.*, 569 U.S. 278, 289 (2013).

step in using the item for a lawful purpose was acceptable.”<sup>255</sup> However, the *Bowman* opinion made no such “qualification”; it explicitly left open “*whether or how* the doctrine of patent exhaustion would apply in such circumstances.”<sup>256</sup>

In a “typical” exhaustion situation, making a patented article is not incidental to using a patented article, so making is not exhausted. But *Bowman* Question 2 begs the question: What degree of “making” is “incidental” for self-replicating technology? The opinion gives only one clue: a cryptic “CP” citation to, and parenthetical quote of, 17 U.S.C. § 117(a)(1): “[I]t is not [a copyright] infringement for the owner of a copy of a computer program to make . . . another copy or adaptation of that computer program provide[d] that such a new copy or adaptation is created as an essential step in the utilization of the computer program.”<sup>257</sup> But that hint is only of limited value: it describes “use” in the singular (“*the* utilization”), whereas *Bowman*’s Question 2 is only directed towards uses that are “for *another* purpose,”<sup>258</sup> implying that there may be different possible uses at play.

What, then, is “another” purpose? Answering this question requires first defining a “primary” purpose for the self-reproducing item in question. This would likely be fact specific, depending on the type of technology in question. One might answer this question at the market level by looking to the subject of the license (if there is one) with the patent holder. Is the user a licensed seed supplier who is “supposed to be” using the technology to produce seeds to sell to farmers? Or is the user a farmer who is “supposed to be” using the technology to produce crops to sell as commodities? Alternatively, one might define the “primary purpose” as the goal of the underlying invention, such as easing weed management<sup>259</sup> or extending shelf-life for consumers.<sup>260</sup> What uses might be “secondary” to these “primary” uses? Some possibilities are research, breeding, and the right to repair. I consider each in turn below.

### 1. *Research and Breeding*

Research is a “secondary” use because it aims to produce *new knowledge from* a self-replicating item, rather than to (re)produce the item itself. Although “research” is not mentioned in the *Bowman* opinion, it arose briefly several

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255. Lim, *supra* note 197, at 8 (citing *Bowman*, 569 U.S. at 289).

256. *Bowman*, 569 U.S. at 289 (emphasis added).

257. *Id.* (alteration in original).

258. *Id.* (emphasis added).

259. As would be the case for Roundup Ready® crops. See *Bowman*, 569 U.S. at 280–81.

260. For example, the Arctic Apple®, which has been engineered to resist browning. See Okanagan Specialty Fruits, *Frequently Asked Questions*, ARCTIC APPLES, <https://www.arcticapples.com/arctic-apples-r/faq/> (last visited Nov. 27, 2019).

times in oral argument,<sup>261</sup> indicating that the Court may have considered it when writing *Bowman's* Question 2. Activities in this category could be anything from using a patented gene sequence as a starting point to design a new product, to simply conducting research on a topic unrelated to the patent but using samples that contain a proprietary gene. The “research” question could thus be divided up between research that is specifically *about* that underlying knowledge, as in the former example, versus research that just happens to *involve an item* embodying the patented knowledge,<sup>262</sup> as in the latter example.

Similarly, “another purpose” could encompass using proprietary plants in a breeding program to create new varieties. Neither the *Bowman* opinion nor the oral argument transcript explicitly mentions breeding. But both discuss PVPA exemptions,<sup>263</sup> and the PVPA research exemption also includes breeding.<sup>264</sup> Thus, the Court may have considered breeding in addition to research.

That being said, the discussion of *J.E.M. Ag Supply*<sup>265</sup> in *Bowman*<sup>266</sup> strongly suggests that the Court would *not* envision exhaustion to absolve breeding or research uses from infringement, at least for self-replicating goods for which PVP protection is available. As described earlier, PVP certificates have exemptions for saving seed and for breeding and research, but patents do not.<sup>267</sup> The *Bowman* Court explicitly used the saved-seed distinction between the PVPA and patent law to justify declining to apply exhaustion to patented seeds saved for replanting.<sup>268</sup> This strongly suggests that the Court would be equally unwilling to allow the other PVPA exemption to sneak into patent law via exhaustion.

Aside from the PVPA, the Bowmark framework can still be applied to breeding and research. First, breeding and research activities that are

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261. See Transcript of Oral Argument, *supra* note 209 at 22–23.

262. Indeed, Justice Kagan posed a hypothetical situation during oral argument in *Bowman* about “a 10-year-old who wants to do a science project of creating a soybean plant, and he goes to the supermarket and gets some edamame, and it turns out that it’s Roundup seeds.” Transcript of Oral Argument, *supra* note 209, at 38.

263. See *Bowman v. Monsanto Co.*, 569 U.S. 278, 286 (2013) (discussing the PVPA’s seed saving exemption); Transcript of Oral Argument, *supra* note 209, at 22–23 (discussing the PVPA’s seed saving and research exemptions).

264. See 7 U.S.C. § 2544 (2018) (stating that “[t]he 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”) (emphasis added).

265. *J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int’l, Inc.*, 534 U.S. 124 (2001).

266. See *Bowman*, 569 U.S. at 286.

267. *Supra* notes 70–72 and accompanying text.

268. See *Bowman*, 569 U.S. at 286.

specifically directed to expanding or applying the underlying knowledge of the patent in question would likely be considered infringing conduct as unauthorized “uses.” If the breeding or research merely involves a sample containing, say, a proprietary gene sequence, but is not directed *per se* to the knowledge embodied in that sequence, then there might still be infringement. The presence of the proprietary sequence, even if itself not the subject of the research, may affect the properties of the whole system such that any acts to produce new knowledge inextricably implicate the patented knowledge.<sup>269</sup>

If it is infringement, then exhaustion is still only available for items subject to an authorized sale. Thus, research or breeding that did *not* derive from such an item (perhaps a researcher synthesized DNA that included a patented sequence, or a grape breeder<sup>270</sup> obtained proprietary parent lines from a third party who was not authorized to sell them) would not be “saved” from infringement by exhaustion.<sup>271</sup>

## 2. *Repair*

In general, repair can be subject to exhaustion in as much as it is a “use” of an item that was the subject of an authorized sale.<sup>272</sup> Indeed, “*Lexmark* clearly considered reuse or repair of a purchased item a normal incident of ownership protected by the exhaustion doctrine.”<sup>273</sup> However, “courts have drawn a distinction between repair and reconstruction” such that “*repair* is permissible, [but] *reconstruction* of a patented product amounts to the making of a new article and thus constitutes patent infringement.”<sup>274</sup> Although “[c]ourts

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269. In the same way that the choice of model organism or specific cell line is so important in biology research. The outcome here would likely be highly fact-dependent as to how the trait or sequence in question affects the overall structure and/or function of the organism, and one may imagine various different fact patterns that could come out either way.

270. Although “most grapes are propagated from cuttings, and not grown from seeds,” new grape varieties may still be produced by breeding. Bruce I. Reisch & Philip Stewart, *Grape Breeding Procedures*, CORNELL GRAPE BREEDING: GRAPE FLOWERS (2001), <http://www.hort.cornell.edu/reisch/grapegenetics/breeding/crossing1.html>.

271. Indeed, a district court, citing *Lexmark*, recently found that exhaustion did not apply to sales of grape vine cuttings by a third party where the patentee had authorized the third party to grow and sell grapes from vines owned by the patentee, but not to sell the vines themselves or cuttings thereof, on which the patentee retained ownership. *Int’l Fruit Genetics, LLC v. Orcharddepot.com*, No. 4:17-CV-02905-JSW, slip op. at 4–5 (N.D. Cal Feb. 12, 2018).

272. See Grinvald & Tur-Sinai, *supra* note 22, at 100.

273. Kobak, Jr., *supra* note 18, at 622; see *Impression Prods. v. Lexmark Int’l, Inc.*, 137 S. Ct. 1523, 1532 (2017) (stating that “a shop that restores and sells used cars . . . is free to repair and resell those vehicles”).

274. Grinvald & Tur-Sinai, *supra* note 22, at 100 (emphases added). With that in mind, it is rather odd that *Lexmark* referred to “the parties . . . who refilled and resold the toner containers . . . as ‘remanufacturers’ rather than repairers.” Kobak, Jr., *supra* note 18, at 622.

have struggled in drawing th[is] line,”<sup>275</sup> courts discussing exhaustion “have clarified that repair may entail the replacement of spent elements and, yet, still be permissible”<sup>276</sup>—*unless “the replacement part itself is protected by a utility or design patent.”*<sup>277</sup> That caveat will become crucial.

But what does “repair” mean for a self-reproducing technology?<sup>278</sup> Perhaps a farmer who wants to grow only conventional crops aims to “repair” a field by removing inadvertent contamination from nearby transgenic fields. Alternatively, perhaps a farmer identifies a genetic mutation in some of their plants and wishes to “correct” it back to the patented sequence.<sup>279</sup>

First, do either of these scenarios represent infringement? To do so, the infringing “act” would need to both use the patented knowledge *and* cross the line from permissible “repair” to impermissible “reconstruction.”<sup>280</sup> For the former case, the farmer arguably uses the patented knowledge by selectively plucking out all seedlings that emerge “too early,” when they know their conventional seed should germinate later than their neighbor’s proprietary seed.<sup>281</sup> However, such an act arguably falls short of “reconstruction”—if anything, it’s *deconstruction*—and is therefore likely non-infringing.

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275. Grinvald & Tur-Sinai, *supra* note 22, at 100.

276. *Id.* at 112 (first citing *Aro Manufacturing Co. v. Convertible Top Replacement Co.*, 365 U.S. 336, 345–46 (1961); then citing Joshua D. Sarnoff, *White Paper on Protecting the Consumer Patent Law Right of Repair and the Aftermarket for Exterior Motor Vehicle Repair Parts: The PARTS Act, S. 812, H.R. 1879, 115th Congress 3* (Unpublished White Paper, Nov. 2017), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3082289](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3082289)).

277. Grinvald & Tur-Sinai, *supra* note 22, at 112 (emphasis added). “[W]hen parts are protected by patents and they need to be replaced in the course of repair, *it is only the patent holder who can make and supply those parts.* Registration of a patent over a part of a product could, thus, be used to circumvent the application of the exhaustion doctrine that would otherwise sanction repair of the product.” *Id.* at 112–13 (emphasis added) (citations omitted).

278. Interestingly, as of this writing, there appear to be no reported cases involving the right to repair in plant patents, or, more generally, in the contexts of seeds, DNA, or genes.

279. Note that this situation is not likely common today, but given the rapid advancement of genetic engineering technologies, this sort of thing is likely to be within even a layman’s toolbox in the not-too-distant future. I do not delve into whether or how any regulatory issues associated with the creation of new genetic modifications in crops would come into play here.

280. *See* Grinvald & Tur-Sinai, *supra* note 274 and accompanying text.

281. Note that this is a hypothetical scenario; conventional seed does not necessarily germinate on a different schedule than patented seed. This scenario would essentially be the inverse of what Bowman did. Bowman applied the patented knowledge of glyphosate resistance to select *for* plants covered by Monsanto’s patent. *See* *Bowman v. Monsanto Co.*, 569 U.S. 278, 285 (2013). Bowman’s identification of glyphosate resistant plants necessarily killed the non-resistant plants. But one might imagine other traits, the knowledge of which would allow one to just as easily select *against* those plants. Hypothetical (but realistic) examples of such traits include differences in height, color, or maturation time.

For the latter case, the farmer also uses the patented knowledge of the function of the gene to guide the repair process. This repair is arguably a permissible “replacement of spent elements.”<sup>282</sup> Such repair would, therefore, be safe from infringement, unless the sequence of the gene to be “repaired” is itself covered by a patent. If so, such an act would become infringement because of the repair caveat about proprietary replacement parts.<sup>283</sup> Thus, “repair” of a self-reproducing technology could become infringement.<sup>284</sup>

The first repair scenario did not represent infringement, so there is no need to bring exhaustion into that analysis. But would the gene repair scenario, which infringed through the use of a proprietary replacement gene, be absolved by exhaustion? That comes down to whether the replacement gene had been subject to an authorized sale. At this point, the situation is similar to the research situation described earlier, which entailed the creation and use of additional copies of a patented gene sequence. Here, it would be the replacement part with the “correct” sequence. Like in the research case, the genetic repair here would be ineligible for exhaustion if the replacement gene was not obtained through an authorized sale. Furthermore, unauthorized creation of copies of the replacement gene would also be unexhausted. Thus, infringing “repair” of a self-reproducing technology could be ineligible for the exhaustion exception. But note that “fixing” does not itself present the exhaustion issue here; rather, the exhaustion problem comes from creating new copies of the replacement gene. Absent that issue, genetic “fixes” accomplished by tinkering with the innards of the seed are likely to be exempted as permissible repairs, even though they may use patented knowledge.

### 3. *Summary and Analysis of Question 2’s Answers*

The application of *Bowmark* to Question 2 shows that exhaustion may, but does not necessarily, apply to self-reproduction that might occur in contexts in which production of the patented good is not necessarily the user’s goal, such as research, breeding, and repair. Is that a good policy? While I have highlighted particular fact patterns that do represent unexhausted infringement, it would be equally easy to tweak those facts and reach the opposite result. This multitude of possible fact patterns itself demonstrates that, even if some activities are “closed” to unauthorized parties, there are still

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282. See Grinvald & Tur-Sinai, *supra* notes 276–277 and accompanying text.

283. See *supra* notes 276–277 and accompanying text, stating that repairs, although typically permissible, are *not* permissible when they involve the insertion of a part that is itself the subject of patent protection.

284. Whether a patent owner would necessarily *sue* over such activities is beside the point.

a variety of other possible and permissible uses. Furthermore, depending on the facts, the actor might find an out through another exemption.<sup>285</sup> This is entirely consistent with how exhaustion has always worked and is therefore equally as fair as the application of exhaustion in any other, non-self-replicating scenario.

## VI. CONCLUSION

The Bowman Court ultimately concluded that, in applying patent exhaustion, it is fair to draw a line between “use” and “making,” even for self-replicating goods, if only for the narrow set of facts of that case. But the Supreme Court openly refused to wade into the application of exhaustion in other more complicated scenarios involving questions of control over, or alternative uses of, a patented self-replicating technology.<sup>286</sup> Although *Bowman*’s two questions remain open on their face, the theoretical underpinnings of *Bowman* and *Lexmark* (what I have termed “Bowmark”) are fully capable of handling them.

Deploying Bowmark on *Bowman*’s questions reveals that there are fact patterns squarely within each question that constitute unexhausted infringement. The examples dissected above are not exhaustive.<sup>287</sup> The point is not that *Bowman*’s questions are *always* or *never* exhausted, but that the framework can work through even complex fact patterns such as those above.<sup>288</sup> *Bowman*’s open questions may appear unassailable when imagined as monolithic, theoretical quandaries, but they are just big buckets for small fact patterns. And those fact patterns, although perhaps technical, do not require new law.<sup>289</sup>

Even if the old law *can* handle exhaustion of self-replicating technologies, is the confusion and frustration surrounding the issue<sup>290</sup> itself a symptom that

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285. This could, for example, include experimental use, but that exemption only applies in the very narrow context of uses “solely for amusement, to satisfy idle curiosity, or for strictly philosophical inquiry . . . .” *Madey v. Duke Univ.*, 307 F.3d 1351, 1362 (Fed. Cir. 2002).

286. *See Bowman v. Monsanto Co.*, 569 U.S. 278, 289 (2013).

287. Pun intended.

288. Bowmark would work equally well on different facts and, depending on the facts, may lead to different outcomes in terms of the presence or absence of exhaustion.

289. Thus, contrary to what some have proposed, there is no need to impose new carve-outs or spin-offs of the exhaustion doctrine specific to self-replicating technologies. *But see* Uwazurike, *supra* note 218, at 422 (proposing a new definition for “making” for the application of exhaustion to self-replicating technologies, which would contain a knowledge requirement); Ghosh & Calboli, *supra* note 191, at 173 (characterizing *Bowman* as “tailoring” the exhaustion doctrine to have special and different rules for self-replicating technologies).

290. Monsanto has been dubbed “one of the most-hated large companies in the world,” due, in large part, to the very technology that was at issue at *Bowman*. Caitlin Dewey, *Why*

society is bristling for something like a fair use exception for patent law? Others have discussed fair use in patent law in more detail,<sup>291</sup> but it is noteworthy that the PVPA, which was tailor-written for self-replicating technology, contains exemptions for saving seed, breeding, and research.<sup>292</sup>

Perhaps there should be more room for fair use in patent law. But, if so, that should be an explicit policy choice through legislation, not piecemeal alterations of the exhaustion doctrine, which, it must be remembered, is actually quite narrow. The purpose of exhaustion is to smooth the flow of commerce of chattels while ensuring that the patentee receives payment for their invention.<sup>293</sup> Exhaustion, unlike fair use, is not about supporting rival or replicative activity, “or the type of rights that buyers expect to receive.”<sup>294</sup>

Even if the narrow application of exhaustion seems harsh or unfair for self-replicating items, it is noteworthy that it aligns with other orthogonal policies that apply to many of the same goods. Entirely aside from patent law, we generally do not allow people to simply make self-replicating products like genetically modified crops or biologically-produced drugs without fairly stringent oversight.<sup>295</sup> And farmers have purchased new seed each season for certain crops long before the advent of recombinant DNA technology.<sup>296</sup> With that in mind, is the potential inapplicability of patent exhaustion to particular scenarios involving self-replicating goods so bizarre?

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*‘Monsanto’ is no more*, WASH. POST (June 4, 2018), <https://www.washingtonpost.com/news/wonk/wp/2018/06/04/why-monsanto-is-no-more/>. That being said, Monsanto’s (now Bayer’s) Roundup Ready® technology is merely one example of a self-replicating trait (even if a dominant one), and it is not necessarily “morally” representative of the entirety of self-replicating goods.

291. See, e.g., Maureen A. O’Rourke, *Toward a Doctrine of Fair Use in Patent Law*, 100 COLUM. L. REV. 1177 (June 2000).

292. See 7 U.S.C. §§ 2543–44 (2018). Furthermore, in 2005, the Supreme Court created a narrow fair-use-like exception for the pharmaceutical industry. See *Merck KGaA v. Integra Lifesciences I, Ltd.*, 545 U.S. 193, 208 (2005) (holding “that the use of patented compounds in preclinical studies is protected . . . as long as there is a reasonable basis for believing that the experiments will produce the types of information that are relevant to” applications to the Food and Drug Administration for approval of human clinical trials or marketing of new drugs) (citations omitted) (internal quotation marks omitted).

293. See *Impression Prods. v. Lexmark Int’l, Inc.*, 137 S. Ct. 1523, 1538 (2017).

294. *Id.*

295. See, e.g., USDA, 6. *What are the roles of government in agricultural biotechnology?*, BIOTECHNOLOGY FAQs, <https://www.usda.gov/topics/biotechnology/biotechnology-frequently-asked-questions-faqs> (last visited Nov. 27, 2019) (summarizing regulations on genetically modified organisms); United States Food & Drug Administration (FDA), *Development & Approval Process*, DRUGS, <https://www.fda.gov/drugs/development-approval-process-drugs> (last visited Nov. 27, 2019) (describing drug approval requirements).

296. See Kloppenburg, *supra* note 79, at 99.

Along similar lines, perhaps it is good public health policy (albeit on a private level) to have self-reproducing goods constantly tied back to the patent owner. This is because this implicitly encourages the expectation that propagation of the product would be controlled, as much as possible, by the patent owner, which implies a degree of responsibility for that product, for better or for worse.<sup>297</sup> When these technologies inherently have the ability to propagate themselves, the presence of strict stewards is crucial. Having something like a heightened mental state requirement for infringement of self-replicating goods<sup>298</sup> might absolve “innocent” infringers and avoid some of the odd infringement scenarios described above. But not having a heightened standard incentivizes legitimate purchasers and users to be good stewards of the technology, and to actively work towards minimizing its “leakage,” “contamination,” or “escape.” Regardless of whether the incentive comes from fear of an infringement suit or some feeling of environmentalism, the positive result on an ecological level is the same. Inevitably, however, some level of leakage is likely, and may just be an occupational hazard. But the exhaustion doctrine helps align and balance incentives to maintain control of the self-replicating technology on both sides of the equation. The patentee wants to maintain its monopoly, on one side, and a farmer does not want their seeds to spread downwind, on the other.

Furthermore, as DNA sequencing becomes cheaper, faster, and easier, tracking the spread of biological self-replicating technologies—and the identities of their patent owners—will be trivial, hardly conjuring the “remora” image that Justice Roberts used to explain the necessity of exhaustion.<sup>299</sup> On the other hand, in some situations it may be advantageous to allow the purchaser-user to continue using and/or making a patented self-replicating technology through one or more use-make cycles after only a single initial purchase.<sup>300</sup> But that, too, does not require altering the exhaustion doctrine.

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297. Interestingly, corn farmers sued seed companies for allowing the companies’ genetically modified seed to contaminate the farmers’ corn supply, resulting in economic loss for the farmers. *In re Starlink Corn Prods. Liab. Litig.*, 212 F. Supp. 2d 828, 833 (N.D. Ill. 2002).

298. See Uwazurike, *supra* note 218, at 422 (proposing a new definition for “making” for exhaustion of self-replicating technologies, which would contain a knowledge requirement).

299. See *Impression Prods. v. Lexmark Int’l, Inc.*, 137 S. Ct. 1523, 1526 (2017) (stating that “[a]llowing patent rights to stick remora-like to that item as it flows through the market would violate the principle against restraints on alienation”).

300. Such as, for example, in the space industry, or in the context of microbial production systems. See, e.g., Kalil, *supra* note 7 (discussing self-replicating structures for space exploration); Waschulin & Specht, *supra* note 10 (discussing microbial bioreactors); Service, *supra* note 11 (discussing “living” cement).

Licenses, as Lexmark was happy to remind the nation, are still an available means of enforcement.<sup>301</sup> Exhaustion is fine as it is.

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301. See *Lexmark*, 137 S. Ct. at 1538 (stating that “dealings between [] parties . . . can be addressed through contract law”).

