

**Accommodating the Evolution of Intellectual Infrastructure:  
Applying Lessons from Trademark and Copyright to Improve Patent Law**

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## Introduction

Intellectual property has a complicated relationship with progress.<sup>1</sup> On the one hand, granting exclusive rights over intangible assets promotes commercial, creative, and inventive activity.<sup>2</sup> Trademarks allow customers to identify specific goods and firms, thus reducing information costs and enhancing competition. Copyrights and patents facilitate incentives to create expressive works and inventions. On the other hand, broad intellectual property protection can undermine productive activity.<sup>3</sup> Allowing Samsung exclusive rights over the trademarked word “television” could confuse consumers and ultimately hamper competition in the electronics industry. Granting J.K. Rowling a copyright on the idea of a boy with mystical powers could prevent other authors from elaborating that concept in new and different ways. And conferring a patent to Pfizer researchers on the naturally-occurring building blocks of Lipitor may inhibit other drug manufacturers from exploiting those same basic materials. Exclusive rights over these “upstream” assets could inhibit “downstream” productivity.<sup>4</sup>

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<sup>1</sup> Further complicating this relationship is the highly-contested meaning of “progress.” This Article focuses on the objective of promoting commercial, creative, and inventive productivity that has long been central to intellectual property law. As many have noted, this originalist paradigm leaves important issues of distributive justice and cultural recognition unresolved. Symposium, *Intellectual Property and Social Justice*, 40 UC DAVIS L. REV. 559 (2006). While this Article does not directly address these concerns, it integrates cultural considerations with economic theory to show that even within the originalist paradigm, intellectual property must accommodate social and cultural evolution in order to promote productivity. See Madhavi Sunder, *IP*<sup>3</sup>, 59 STAN. L. REV. 257, 264 (2006); *infra* text accompanying notes 23-25.

<sup>2</sup> See U.S. CONST. art. I, § 8, cl. 8 (authorizing copyrights and patents “[t]o promote the progress of science and useful arts”); *infra* Part I.A (discussing trademark law’s utilitarian basis).

<sup>3</sup> See, e.g., Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCIENCE 698 (1998); Suzanne Scotchmer, *Standing on the Shoulders of Giants: Cumulative Research and the Patent Law*, 5 J. ECON. PERSP. 29, 37-38 (1991).

<sup>4</sup> See Peter Yun-hyoung Lee, *Inverting the Logic of Scientific Discovery: Applying Common Law Patentable Subject Matter Doctrine to Constrain Patents on Biotechnology Research Tools*, 19 HARV. J.L. & TECH. 79, 81 (2005) [hereinafter Lee, *Inverting the Logic of Scientific Discovery*].

To address this problem, intellectual property law distinguishes between basic intellectual assets that reside in the public domain and particularized creations that are appropriate subjects of exclusive rights.<sup>5</sup> In some sense, this is a distinction between assets that are “raw” and “cooked.”<sup>6</sup> Generic words, abstract ideas, and natural phenomena are not eligible for intellectual property protection. These raw materials constitute “intellectual infrastructure” that anyone may freely use as inputs to commercial, creative, and inventive pursuits.<sup>7</sup> However, individuals may obtain exclusive rights over cooked creations: individualized brand names, particularized expressions, and specific inventions. “Raw” and “cooked” describe substantive attributes of the assets in question, but they also indicate appropriate property regimes for controlling them: raw assets are freely available while cooked elements are eligible for individual ownership.<sup>8</sup>

In a curious process, intellectual assets can become so “cooked” that they become “raw.”<sup>9</sup> In other words, particularized assets can become so widely-adopted and so indispensable for a broad range of downstream uses that they cross a threshold and

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<sup>5</sup> See Jessica Litman, *The Public Domain*, 39 EMORY L.J. 965, 967 (1990) (“[T]he public domain is law’s primary safeguard of the raw material that makes authorship possible.”).

<sup>6</sup> I use these terms slightly differently from Claude Levi-Strauss, for whom they distinguished “natural” from “cultural” elements. See CLAUDE LEVI-STRAUSS, *THE RAW AND THE COOKED* (John Weightman & Doreen Weightman trans., 1969); see also Bradford S. Simon, *Intellectual Property and Traditional Knowledge: A Psychological Approach to Conflicting Claims of Creativity in International Law*, 20 BERKELEY TECH. L.J. 1613, 1618 (2005). For my purposes, “raw” assets represent infrastructural building blocks for which enhanced access is appropriate and “cooked” assets are refined, particularized, and properly subject to exclusive rights.

<sup>7</sup> See Brett M. Frischmann, *An Economic Theory of Infrastructure and Commons Management*, 89 MINN. L. REV. 917, 928 (2005) [hereinafter Frischmann, *Economic Theory*].

<sup>8</sup> See *id.* at 990-1004.

<sup>9</sup> Here I conscientiously exploit the multifaceted definition of “cooking.” In general, “cooking” involves adding social input to enhance the value of an underlying asset. Thus an individual can “cook” raw materials like words, ideas, and natural principles to create particularized expressions and inventions. Cooking can also involve enhancing the value of an asset through widespread social usage and reliance. Thus, trademarked words, creative expressions, and inventions can become further “cooked” through broad social adoption. “Raw” assets are basic building blocks that warrant some kind of liberalized access. In some cases, even “cooked” expressions and inventions can attain the status of “raw” materials.

become basic infrastructure. Trademarked terms can become generic words, particularized expressions can become stock literary elements, and specific inventions can become standard platforms for technological development. Some intellectual property doctrines recognize this transformation by liberalizing access to “cooked” infrastructural assets that might otherwise be subject to exclusive rights. These doctrines recognize that infrastructure is a moving target, and dynamically adjust what it classifies as infrastructure to serve society’s evolving need for “raw” materials. This Article argues that while trademark and copyright appropriately define intellectual infrastructure in a manner sensitive to evolving social practice and needs, patent law unfortunately does not.

Part I explores “intellectual infrastructure” as a unifying attribute of trademark, copyright, and patent law. It first situates intellectual infrastructure within the shared utilitarian objectives of these disciplines, arguing that differential treatment of intellectual infrastructure and application—the raw and the cooked—helps facilitate downstream productivity. In so doing, Part I builds upon previous work exploring infrastructure theory and applying it to intellectual property.<sup>10</sup> Part I then introduces the principal doctrines defining intellectual infrastructure: trademark’s doctrine of genericity; copyright’s idea-expression dichotomy; and patent law’s prohibition against patenting natural laws, physical phenomena, and abstract ideas.<sup>11</sup>

Part II turns to real property to highlight the socially contingent and evolving nature of infrastructure. It shows how widespread social reliance on assets that facilitate

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<sup>10</sup> See Frischmann, *Economic Theory*, *supra* note 7; Brett M. Frischmann & Mark A. Lemley, *Spillovers*, 107 COLUM. L. REV. 257 (2007).

<sup>11</sup> The right of publicity could also fit within this framework, as it also distinguishes between intellectual infrastructure and application. See *White v. Samsung Electronics America, Inc.*, 989 F.2d 1512, 1512-23 (9th Cir. 1993) (Kozinski, J., dissenting from denial of rehearing en banc) (criticizing the expansion of rights of publicity). I here focus on the “core” intellectual property disciplines. See James Gibson, *Risk Aversion and Rights Accretion in Intellectual Property Law*, 116 YALE L.J. 882, 885 (2007).

downstream activity, such as roads, waterways, and even open fields, can confer on them certain attributes of infrastructure. Applying the concept of “inherently public property,” Part II then explores how legal doctrines protect this social reliance by providing public access to otherwise private property.<sup>12</sup> Applied in the intellectual property context, widespread social reliance can also confer infrastructural status on “cooked” creations that facilitate downstream activity, thus rendering them “raw” materials warranting liberalized access.

Part III then compares to what extent various intellectual property doctrines legally accommodate the evolving nature of intellectual infrastructure. An interesting continuum emerges. Trademark’s doctrine of genericity is highly attentive to evolving social practice in determining when a trademarked term has become a generic word, thus warranting its preservation in the public domain as intellectual infrastructure. Copyright occupies a somewhat intermediate position by privileging elements that society has come to recognize as “stock” or “standard” as nonprotectable infrastructure. Patent law takes the narrowest and most rigid approach to defining intellectual infrastructure. It does not accommodate the reality that certain patented inventions, such as gene splicing, human embryonic stem cells, and information technology standards, can become so widely-used and indispensable for a broad array of downstream applications that they warrant liberalized availability as basic infrastructure. In other words, patent law does not recognize that even within the twenty-year patent term, some inventions may become so cooked that they should be considered raw. Part III considers some explanations for

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<sup>12</sup> Carol Rose, *The Comedy of the Commons: Custom, Commerce, and Inherently Public Property*, 53 U. CHI. L. REV. 711 (1986) [hereinafter Rose, *The Comedy of the Commons*].

patent law's differences from trademark and copyright, but ultimately concludes that they do not justify patent law's rigid approach.

Having identified this problem, Part IV offers a solution. In particular, it draws upon the Supreme Court's recent decision in *eBay v. MercExchange*, which provides courts greater latitude to grant damages rather than issue injunctions in patent infringement suits.<sup>13</sup> The possibility of awarding damages, i.e., protecting a patent with a liability rule,<sup>14</sup> and the context-sensitive test for making that determination allow courts to consider whether a patented invention is intellectual infrastructure when fashioning infringement remedies. *eBay* thus permits courts to calibrate protection of patented infrastructure, relaxing it where necessary to facilitate greater access to infrastructure and concomitant downstream productivity. Ultimately, this Article argues for a two-tiered system in which courts continue to protect ordinary intellectual applications with a property rule, but where they have the option of protecting patented intellectual infrastructure with a liability rule. This approach enhances access to patented infrastructure while still maintaining dynamic incentives to invent.

In building towards its recommendations for patent law, this Article offers several second-order contributions as well. First, it highlights the value of intradisciplinary comparison within intellectual property law.<sup>15</sup> While trademark, copyright, and patent

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<sup>13</sup> 126 S. Ct. 1837 (2006).

<sup>14</sup> See Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089 (1972).

<sup>15</sup> See, e.g., W. LANDES & R. POSNER, *THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW* 205 (2003) (noting similarities between patent law's exclusion of scientific and mathematical principles and copyright's exclusion of ideas); Maureen A. O'Rourke, *Toward a Doctrine of Fair Use in Patent Law*, 100 COLUM. L. REV. 1177 (2000) (proposing an analog of copyright's fair use doctrine for patent law); Mark Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989 (1997) (suggesting a "blocking patents" analog for copyright) [hereinafter Lemley, *Economics of Improvement*]; John Shepard Wiley, Jr., *Copyright at the School of Patent*, 58 U. CHI. L. REV. 119 (1991) (proposing reforms to the idea-expression dichotomy based on analogous concepts in patent law).

exhibit significant theoretical and doctrinal differences, they can still borrow fruitfully from each other when attempting to solve certain shared problems. Second, such intradisciplinary comparison reveals some natural limitations on intellectual property rights.<sup>16</sup> At its core, intellectual property law is structured to maintain access to basic infrastructure and prevent pernicious intellectual monopolies, objectives that counsel for relaxing exclusive rights in certain circumstances. Third, this Article integrates two well-established schools of legal theory—law and economics and communal norms analysis—to show how legal definitions of intellectual property—and the vast incentive structures intrinsic to those designations—are responsive to evolving social practice.<sup>17</sup> Intellectual property can only achieve its traditional goal of encouraging productivity if it is sensitive to the dynamic needs and behaviors of creative communities.

## **Part I. The Unifying Principle of Intellectual Infrastructure**

### **A. The Theoretical Foundations of Intellectual Infrastructure**

This article uses analogy to compare trademark, copyright, and patent law,<sup>18</sup> a method that courts and commentators have found fruitful.<sup>19</sup> While one must be careful

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<sup>16</sup> Many commentators have decried the ever-expanding nature of intellectual property rights. See, e.g., James Boyle, *The Second Enclosure Movement and the Construction of the Public Domain*, 66 LAW & CONTEMP. PROBS. 33, 37-40 (2003).

<sup>17</sup> See Sunder, *supra* note 1, at 264 (urging scholars to integrate economic and cultural accounts of intellectual property).

<sup>18</sup> See Anupam Chander, *Minorities, Shareholder and Otherwise*, 113 YALE L.J. 119, 152 (2003) (comparing minorities in the shareholder and constitutional contexts and noting that “[s]uch intradisciplinarity seems especially appropriate to law, a discipline that relies on analogical reasoning”).

<sup>19</sup> See *supra*, note 15; *eBay v. MercExchange*, 126 S. Ct. 1837, 1840 (2006) (applying copyright practice to justify traditional equitable principles for patent injunctions); *Eldred v. Ashcroft*, 537 U.S. 186, 201 (2003) (“Because the [Constitutional] Clause empowering Congress to confer copyrights also authorizes patents,

not to elide significant differences among these disciplines,<sup>20</sup> preoccupation with those differences should not obscure the presence of common ends and mechanisms employed to achieve them. Subject matter is the most obvious point of convergence: intellectual property deals with property rights in intangible assets. Promotion of progress is another commonality,<sup>21</sup> and serves as a critical point of departure in identifying the shared feature of intellectual infrastructure.

Of course, “progress” is a highly-contested concept.<sup>22</sup> In my analysis, I focus on traditional interpretations of progress in the intellectual property context relating economic, creative, and inventive productivity to aggregate social welfare. Although this originalist rationale does not directly address values such as distributional equity and cultural recognition, it holds great currency in positive intellectual property doctrine.<sup>23</sup> As others have argued, economic, cultural, and other theories all have roles to play in explaining and critiquing intellectual property.<sup>24</sup> Indeed, my overarching argument is

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congressional practice with respect to patents informs our inquiry.”); *Sony Corp. v. Universal City Studios, Inc.*, 464 U.S. 417, 439 (1984) (noting the “historic kinship” of copyright and patent law); *Laboratory Corp. of America Holdings, v. Metabolite Laboratories, Inc.*, 126 S. Ct. 2921, 2923 (2006) (Breyer, J., dissenting) (noting the similarity between patent law’s exclusion of scientific, mathematical, and technological principles and copyright’s exclusion of ideas); *United States ex rel. The Baldwin Co. v. Robertson*, 265 U.S. 168, 180 (1924) (recognizing that early trademark legislation was intended to afford applicants the same resort to equitable remedies as enjoyed by patent applicants); *Milstein v. Roth*, 58 F.3d 27, 32 (2d Cir. 1995) (“[J]ust as copyright law does not protect ideas but only their concrete expressions, neither does trade dress protect an idea, a concept, or a generalized type of appearance.”).

<sup>20</sup> Cf. *Baker v. Selden*, 101 U.S. 99, 102 (1879) (noting that patent may extend further than copyright in propertizing technical ideas); *Canal Co. v. Clark*, 80 U.S. 311, 322 (1871) (observing that trademarks, unlike copyrighted or patented works, need not be original to the creator). My arguments are based on *functional analogy* among these doctrines, not analytical identity.

<sup>21</sup> Mark A. Lemley, *Property, Intellectual Property, and Free Riding*, 83 TEX. L. REV. 1031, 1031 (2005) (“Intellectual property protection in the United States has always been about generating incentives to create.”) [hereinafter Lemley, *Free Riding*].

<sup>22</sup> Sunder, *supra* note 1, at 284 (“The utilitarian approach to intellectual property does not ask: Who makes the goods? Who profits, and at whose expense?”); Anupam Chander & Madhavi Sunder, *The Romance of the Public Domain*, 92 CAL. L. REV. 1331 (2004) (emphasizing distributional concerns in intellectual property); Julie E. Cohen, *Creativity and Culture in Copyright Theory*, 40 U.C. DAVIS L. REV. 1151, 1162-70 (2007).

<sup>23</sup> See Sunder, *supra* note 1.

<sup>24</sup> *Id.* at 264; see Cohen, *supra* note 22, at 1155-62.

that for intellectual property to effectively fulfill its originalist goal of maximizing productivity, it must dynamically accommodate the evolving cultures of the communities it serves.

While trademark operates in a *sui generis* fashion relative to copyright and patent, it nevertheless exhibits important theoretical and doctrinal similarities to those other disciplines. Although trademark is not focused on providing incentives to create,<sup>25</sup> it is overwhelmingly utilitarian in its aims.<sup>26</sup> It seeks to prevent public deception whereby consumers purchase one firm's goods under the mistaken belief that they are those of another.<sup>27</sup> Trademarks reduce information costs and enable consumers to make better and cheaper purchasing decisions.<sup>28</sup> Trademarks also allow firms to establish valuable reputations, internalize goodwill, and counteract free-riding by imitators.<sup>29</sup> While protecting firms with solid reputations suggests a moral desert basis for trademark law, this theory falters when considering that no amount of effort or expense on the part of a firm will save its trademark from cancellation if it has become generic.<sup>30</sup> Ultimately, Congress's utilitarian aim in enacting the Lanham Act,<sup>31</sup> the modern framework for federal trademark law, was to foster competition and enhance general consumer welfare.<sup>32</sup>

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<sup>25</sup> See Mark A. Lemley, *The Modern Lanham Act and the Death of Common Sense*, 108 YALE L.J. 1687, 1695 (1999) (noting that trademark does not exist to encourage creating more trademarked terms) [hereinafter Lemley, *Lanham Act*].

<sup>26</sup> See LANDES & POSNER, *supra* note 15, at 166.

<sup>27</sup> Canal Co., 80 U.S. at 323; *see* Kidd v. Johnson, 100 U.S. 617, 620 (1879); *Two Pesos, Inc. v. Taco Cabana, Inc.*, 505 U.S. 763, 767-78 (1992) (noting that the goals of the Lanham act are to prevent deceptive marks and protect firms against unfair competition).

<sup>28</sup> Lemley, *Lanham Act*, *supra* note 25, at 1690.

<sup>29</sup> *Id.*

<sup>30</sup> *See infra* Part I.B.i.

<sup>31</sup> Trademark Act of 1946, 60 Stat. 427, codified as amended, 15 U.S.C. §§ 1051 *et seq.*

<sup>32</sup> S. Rep. No. 1333, 79th Cong., 2d Sess., 3-5 (1946); *see* Park 'N Fly, Inc. v. Dollar Park and Fly, Inc., 469 U.S. 189, 198 (1985).

In some ways, the constitutional origin of copyright and patent law renders them even more explicitly utilitarian than trademark. While federal trademark law relies on the Commerce Clause for constitutional authorization,<sup>33</sup> copyright and patent arise from the so-called Intellectual Property clause of the Constitution, which states that “Congress shall have the Power . . . To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.”<sup>34</sup> The provision establishes a utilitarian basis for the copyright and patent power: Congress can confer copyrights and patents *in order to* promote culture, learning, and technology.<sup>35</sup>

While copyright substantially impacts deontological and ethical concerns,<sup>36</sup> its doctrinal basis has traditionally been understood as utilitarian.<sup>37</sup> As Justice Potter Stewart remarked, “The immediate effect of our copyright law is to secure a fair return for an ‘author’s’ creative labor. But the ultimate aim is, by this incentive, to stimulate artistic creativity for the general public good.”<sup>38</sup> Relying on the text of the Intellectual

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<sup>33</sup> See *In re Trade-Mark Cases*, 100 U.S. 82 (1879).

<sup>34</sup> U.S. CONST. art. I, § 8, cl. 8.

<sup>35</sup> Some scholars debate the original meaning of “progress” in this context. See, e.g., Malla Pollack, *What Is Congress Supposed To Promote?: Defining “Progress” in Article I, Section 8, Clause 8 of the United States Constitution, or Introducing the Progress Clause*, 80 NEB. L. REV. 754, 755 (2001) (arguing that the framers of the Intellectual Property clause equated “progress” with “diffusion”).

<sup>36</sup> See Sunder, *supra* note 1, at 286-88 (noting that moral rather than efficiency concerns animated the Supreme Court’s ruling in *MGM v. Grokster*).

<sup>37</sup> Margaret Jane Radin has influentially argued that ownership of property may be essential to realize one’s potential as a human being. Margaret Jane Radin, *Property and Personhood*, 34 STAN. L. REV. 957 (1982). So-called “personhood theory” justifies protecting copyrighted works as extensions of the author’s persona. While this view has exhibited great currency in European moral rights, U.S. copyright law is predominantly focused on incentives to create. But see Roberta Rosenthal Kwall, “*Author-Stories: Narrative’s Implications for Moral Rights and Copyright’s Joint Authorship Doctrine*,” 75 S. CAL. L. REV. 1, 5, 26 (2001) (noting that the Visual Artists Rights Act includes limited rights of attribution and integrity); Neil Netanel, *Copyright Alienability Restrictions and the Enhancement of Author Autonomy: A Normative Evaluation*, 24 RUTGERS L. J. 347 (1993); see generally Douglas Y’Barbo, *The Heart of the Matter: The Property Right Conferred by Copyright*, 49 MERCER L. REV. 643, 659-60 (1998) (describing the incentives and personhood approaches as the two dominant theoretical paradigms of copyright).

<sup>38</sup> *Twentieth Century Music Corp. v. Aiken*, 422 U.S. 151, 156 (1975); see H.R. Rep. No. 2222, 60th Cong., 2d Sess., 7 (1909).

Property clause, the Supreme Court has repeatedly disavowed non-utilitarian justifications for copyright.<sup>39</sup> Patent law is similarly instrumental. The constitutional authorization to issue patents in order to promote technological progress is both a grant of power and a limitation.<sup>40</sup> The Supreme Court has recognized that the “ultimate goal of the patent system is to bring new designs and technologies into the public domain through disclosure.”<sup>41</sup> While acknowledging the valuable contributions of inventors,<sup>42</sup> the Court has accordingly rejected any potential moral rights or just desert theories for granting patents.<sup>43</sup>

At a general level, trademark, copyright, and patent seek to promote productivity by conferring exclusive rights over various intellectual creations.<sup>44</sup> This model equates property rights with progress.<sup>45</sup> However, exclusivity is not a natural right, but is contingent on promoting productivity.<sup>46</sup> As such, all three disciplines must address a shared question: what happens when conferring exclusive rights actually *inhibits*

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<sup>39</sup> See, e.g., *Eldred v. Ashcroft*, 537 U.S. 186, 212 (2003) (characterizing Congress’ “constitutional command” as creating “a ‘system’ that ‘promote[s] the Progress of Science’”); *Feist Publications, Inc. v. Rural Telephone Service Co., Inc.*, 499 U.S. 340, 349 (1991) (rejecting the so-called “sweat of the brow” theory of copyright); *United States v. Paramount Pictures*, 334 U.S. 131, 158 (1948) (“The copyright law, like the patent statutes, makes reward to the owner a secondary consideration.”); *Fox Film Corp. v. Doyal*, 286 U.S. 123, 127 (1932) (“The sole interest of the United States and the primary object in conferring the monopoly lie in the general benefits derived by the public from the labors of the authors.”); see also Leslie A. Kurtz, *Copyright: The Scenes a Faire Doctrine*, 41 FLA. L. REV. 79, 83 (1979) (“The function of copyright is to promote creativity and the dissemination of creative works, so that the public may benefit from the labor of authors.”) [hereinafter Kurtz, *The Scenes a Faire Doctrine*].

<sup>40</sup> *Graham v. John Deere*, 383 U.S. 1, 5 (1966).

<sup>41</sup> *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 151 (1989).

<sup>42</sup> *United States v. Dubilier Condenser Corp.*, 289 U.S. 178, 186 (1933) (“An inventor . . . gives something of value to the community by adding to the sum of human knowledge.”).

<sup>43</sup> *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 330-31 (1945) (“The primary purpose of our patent system is not reward of the individual but the advancement of the arts and sciences.”); 325 U.S. at 331 n. 1 (noting that the purpose of patents is “much deeper and the effect much wider than individual gain”) (quoting TNEC Hearings, Part 3, p. 857).

<sup>44</sup> See Cohen, *supra* note 22, at 1170 (“A legal regime mean to promote progress requires a set of premises about the ways in which progress develops.”).

<sup>45</sup> See Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV. 347 (1967) (describing how property rights help internalize externalities and thus encourage efficient resource exploitation).

<sup>46</sup> See *Graham*, 383 U.S. at 9.

progress?<sup>47</sup> After all, trademarks on ordinary words might hamper commerce, and copyrights and patents on ideas and natural phenomena might inhibit downstream productive activity that relies on these assets as inputs.

Accordingly, all three disciplines have developed functional doctrines to limit exclusive rights in the interest of facilitating subsequent progress. Specifically, all three disciplines distinguish protectable intellectual *application* from non-protectable intellectual *infrastructure*.<sup>48</sup> Infrastructural assets include generic words (and language itself), creative and literary ideas, facts, stock literary devices, natural laws, physical phenomena, and abstract technical ideas. These basic building blocks of intellectual productivity reside in the public domain for all to use.<sup>49</sup> Conversely, intellectual property protection ordinarily extends only to particularized, cooked creations arising from these raw materials.

In elaborating the concept of intellectual infrastructure, I build upon the work of Brett Frischmann and Mark Lemley.<sup>50</sup> Frischmann presents a demand-side model defining an infrastructural resource as satisfying three criteria: 1) the resource may be consumed nonrivalrously; 2) the resource derives its primary social value as an input to downstream productive activity; and 3) the resource serves as an input into a wide range

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<sup>47</sup> Most commentators have focused on this shared concern between copyright and patent. See, e.g., O'Rourke, *supra* note 15, at 1180. However, concerns with macroscopic progress also inform trademark's doctrine of genericity.

<sup>48</sup> I make no claim to coining "intellectual infrastructure." See Frischmann, *Economic Theory*, *supra* note 7, at 990-1004.

<sup>49</sup> These assets occupy one region of the public domain, alongside creative works and inventions for which the protected terms have expired, assets dedicated to the public, and other resources either ineligible or no longer eligible for exclusive rights. See Pamela Samuelson, *Challenges in Mapping the Public Domain, in THE FUTURE OF THE PUBLIC DOMAIN: IDENTIFYING THE COMMONS IN INFORMATION LAW 7-25* (Lucie Guibault & P. Bernt Hugenholtz eds., 2006). These assets also function as infrastructural elements. See Frischmann & Lemley, *supra* note 10, at 291. However, I focus here on "pure" intellectual infrastructure: words, ideas, and natural phenomena, which intellectual property immediately places in the public domain precisely because of their value as inputs to downstream productivity.

<sup>50</sup> Frischmann, *Economic Theory*, *supra* note 7; Frischmann & Lemley, *supra* note 10.

of goods and services, including private, public, and nonmarket goods.<sup>51</sup> The immense value of these resources as facilitators of broad arrays of downstream activity provides a powerful argument, at least from the demand side, for allowing open access to them.<sup>52</sup> Extended to intellectual property, intangible resources satisfying these criteria qualify as intellectual infrastructure.<sup>53</sup>

While generic words, ideas, and natural phenomena possess some intuitive characteristics of infrastructure, Frischmann’s theory provides a heuristic for understanding how and why these assets are infrastructural. The first criterion, nonrivalry, refers to the property of infrastructural (and other) resources that additional consumption does not diminish their availability for others. For example, subject to constraints of congestion and capacity, additional drivers on a road or users in a telephone network do not diminish the availability of those infrastructural resources for others.<sup>54</sup> Intangible assets, such as generic words, ideas, and natural laws, exhibit complete nonrivalry because additional “consumption” of these resources does not diminish their availability at all.<sup>55</sup> The second criterion highlights that infrastructural resources are “intermediate”: their primary social value resides as inputs to downstream productivity.<sup>56</sup> With apologies to Kant, the value of words, abstract ideas, and properties of nature in the utilitarian context of the intellectual property system derives largely from their being *means*—enablers of commercial transactions, creative expressions, and

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<sup>51</sup> Frischmann, *Economic Theory*, *supra* note 7, at 956.

<sup>52</sup> See Frischmann, *Economic Theory*, *supra* note 7, at 922-23; Frischmann & Lemley, *supra* note 10, at 282 (“Frischmann’s organizing heuristic is ‘if infrastructure, then commons.’”).

<sup>53</sup> Frischmann, *Economic Theory*, *supra* note 7, at 990-1004.

<sup>54</sup> *Id.* at 953-55.

<sup>55</sup> See VI WRITING OF THOMAS JEFFERSON 180-81 (Washington ed.) (describing ideas as “expansible over all space, without lessening their density in any point”).

<sup>56</sup> Frischmann, *Economic Theory*, *supra* note 7, at 957.

tangible inventions—rather than ends in and of themselves.<sup>57</sup> Frischmann’s third criterion emphasizes the widespread potential downstream applications of infrastructure.<sup>58</sup> While many resources, from beakers to mechanical pencils, may be inputs into some kind of downstream production chain, infrastructure is different. Intellectual infrastructure such as words, ideas, and natural phenomena contribute to an extremely wide range of downstream applications as well as many *kinds* of applications, including public and nonmarket goods.<sup>59</sup> The variety in the number and types of outputs arising from infrastructure renders measuring the value of these assets extremely difficult and helps explain why it may be particularly difficult for producers of infrastructure to capture all of its value.<sup>60</sup>

As Frischmann and Lemley recognize, infrastructure theory resonates deeply with certain intellectual property doctrines. Subject matter exclusions such as copyright’s idea-expression dichotomy and the nonpatentability of abstract ideas help keep intellectual infrastructure in the public domain.<sup>61</sup> In addition to subject matter exclusions, use-specific exclusions such as the fair use defense also privilege the infrastructural application of certain copyrighted materials.<sup>62</sup>

I build upon Frischmann and Lemley’s work in several ways. Under the rubric of intellectual infrastructure, I include trademark’s doctrine of genericity, copyright’s idea-expression dichotomy and the related scenes a faire doctrine, and the prohibition against

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<sup>57</sup> COMM. ON MEASURING & IMPROVING INFRASTRUCTURE PERFORMANCE, NAT’L RESEARCH COUNCIL, MEASURING AND IMPROVING INFRASTRUCTURE PERFORMANCE 5 (1995) (“Infrastructure is a means to other ends, and the effectiveness, efficiency, and reliability of its contribution to these other ends must ultimately be the measure of infrastructure performance.”).

<sup>58</sup> Frischmann, *Economic Theory*, *supra* note 7, at 957-58.

<sup>59</sup> *Id.*

<sup>60</sup> *Id.* at 958.

<sup>61</sup> *Id.* at 1003; Frischmann & Lemley, *supra* note 10, at 284-92.

<sup>62</sup> Frischmann, *Economic Theory*, *supra* note 7, at 1002-03; Frischmann & Lemley, *supra* note 10, at 286-90.

patenting natural laws, natural phenomena, and abstract ideas. I therefore bring trademark into the fold and provide a fuller account of intellectual infrastructure's doctrinal manifestations in copyright and patent law. Additionally, this inquiry illuminates the conceptual foundations of intellectual infrastructure by showing how monopoly and substitutability play central roles in defining these assets and distinguishing them from other kinds of intellectual inputs. Most significantly, I examine the socially contingent nature of intellectual infrastructure and how widespread use and reliance can transform "cooked" terms, expressions, and inventions into "raw" materials warranting liberalized access.

## **B. The Doctrinal Framework for Intellectual Infrastructure**

### **i. Trademark and Genericity**

Federal trademark law authorizes cancellation of a registered mark at any time if it becomes the generic name for the good or service for which it is registered.<sup>63</sup> Thus firms may not trademark the terms "car" or "quesadilla" because these are generic words signifying a general class of products.<sup>64</sup> These terms are "raw" intellectual infrastructure, free for all to use. However, General Motors and Taco Bell may trademark the terms "Corvette" and "Crunchwrap Supreme," because these "cooked" terms signify particular products unique to those firms.

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<sup>63</sup> 15 U.S.C. § 1064(3). Genericity has its roots in the common law of trademarks. *See* Restatement (Third) of Unfair Competition § 13 (1995).

<sup>64</sup> *See* *Abercrombie & Fitch Co. v. Hunting World, Inc.*, 537 F.2d 4, 9 (2d Cir. 1976).

Ex ante, generic terms that represent the “common descriptive name” of a product category are not eligible for trademark.<sup>65</sup> Ex post, even fabricated terms such as “aspirin” or “cellophane,” which originated as trademarks, can lose their protected status if they become the generic terms by which the public refers to a category of goods.<sup>66</sup> This illustrates the phenomenon of genericide, which also applies to trampoline, yo-yo, brassiere, escalator, and thermos, all of which were originally trademarks but then lost that status upon entering the vernacular as generic words.<sup>67</sup> Recently, the Fourth Circuit even held that “You Have Mail” is a generic phrase.<sup>68</sup> In a sense, these terms are so cooked that they are now considered raw.

Genericity has several theoretical justifications. First and foremost, generic words cannot function as trademarks because they do not identify individual sources.<sup>69</sup> A trademark on the word “hamburger” would be improper because that word signifies a general class of products rather than any individual one. Second, at a broader level, limiting exclusive rights through genericide advances the utilitarian goals of trademark law by reducing consumer confusion and enhancing competition. If McDonald’s trademarked “hamburger,” then Burger King, In-N-Out Burger, and Wendy’s would be infringing that trademark if they sold their products using the same name. Consumers might be confused into thinking that only McDonald’s sold “hamburgers.” Extrapolating beyond the single confused consumer, trademarks on generic words could hamper commercial transactions and reduce competition.

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<sup>65</sup> Hans Zeisel, *The Surveys that Broke Monopoly*, 50 U. CHI. L. REV. 896, 896 (1983).

<sup>66</sup> Bayer Co. v. United Drug Co., 272 F. 505 (S.D.N.Y. 1921) (invalidating the trademark on “aspirin” in certain contexts); DuPont Cellophane Co., Inc. v. Waxed Products Co., Inc., 85 F.2d 75 (2d Cir. 1936) (holding similarly for “cellophane”).

<sup>67</sup> John Dwight Ingram, *The Genericide of Trademarks*, 2 BUFF. INT. PROP. L. J. 154, 154 (2004).

<sup>68</sup> America Online, Inc., v. AT&T Corp., 243 F.3d 812 (4th Cir. 2001).

<sup>69</sup> See Lemley, *Lanham Act*, *supra* note 25, at 1695 (“[T]he economic case for brands and advertising is undone to the extent that trademarks are used in ways that affirmatively confuse consumers.”).

Without a genericity doctrine, firms could leverage trademarks on generic words into economic monopolies. In *Canal Co. v. Clark*, the Supreme Court held that the Delaware and Hudson Canal Company could not trademark “Lackawanna Coal,” so-named for the region of Pennsylvania from which it was mined.<sup>70</sup> In applying genericity doctrine to geographical names, the Court held that “[n]o one can claim protection for the exclusive use of a trade-mark or trade-name which would practically give him a monopoly in the sale of any goods other than those produced or made by himself.”<sup>71</sup> More recently, the Second Circuit has stated that preventing monopolies represents the “guiding principle” of distinguishing protectable from nonprotectable marks.<sup>72</sup>

Genericity helps trademark achieve its utilitarian objectives.<sup>73</sup> Generic words satisfy the three criteria for infrastructure: they are nonrival assets that are valuable as inputs into a wide array of downstream uses.<sup>74</sup> In a sense, language is the ultimate infrastructure, as it is the raw foundation for all communication and expression. Accordingly, scholars have recognized a First Amendment basis for preventing firms from obtaining exclusive rights over generic words.<sup>75</sup> Notwithstanding burdens on speech, however, allowing firms to trademark generic words is simply bad for business. Monopolization of the language of commerce would lead to consumer confusion and

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<sup>70</sup> 80 U.S. 311, 328 (1871).

<sup>71</sup> *Id.* at 323.

<sup>72</sup> *Star Industries, Inc. v. Bacardi & Co. Limited*, 412 F.3d 373, 382 (2d Cir. 2005); *cf. Virgin Enters. Ltd. v. Nawab*, 335 F.3d 141, 147 (2d Cir. 2003).

<sup>73</sup> The legislative history of the Lanham Act states that “[t]rade-marks, indeed are the very essence of competition, because they make possible a choice between competing articles. . . .” S. Rep. No. 1333, 79th Cong., 2d Sess. 4 (1946); H.R. Rep. No. 219 79th Cong., 1st Sess. 3 (1945).

<sup>74</sup> See Frischmann, *Economic Theory*, *supra* note 7, at 957-58

<sup>75</sup> See Rochelle Cooper Dreyfuss, *Expressive Genericity: Trademarks as Language in the Pepsi Generation*, 65 NOTRE DAME L. REV. 397 (1990) [hereinafter Dreyfuss, *Expressive Genericity*].

economic monopolies.<sup>76</sup> Alternatively, open access to a shared commercial language allows consumers and firms to communicate most effectively. A similar, if more explicit, concern with facilitating productive activity appears in copyright's idea-expression dichotomy and related doctrines.

## ii. Copyright and the Idea-Expression Dichotomy

Copyright, like trademark, also distinguishes between unprotectable intellectual infrastructure and protectable intellectual application. However, the structure of this distinction is different; copyright keeps infrastructure in the public domain as the raw building blocks of subsequent creation. Copyright has developed several doctrines to draw this distinction,<sup>77</sup> but all of them are conceptually related to the idea-expression dichotomy. This doctrine is codified in the copyright statute, which excludes from protection “any idea, procedure, process, system, method of operation, concept, principle, or discovery.”<sup>78</sup> According to this doctrine, copyright extends only to the particularized expression of a work (and minor deviations from this expression),<sup>79</sup> and not to the general ideas contained in that work. Distinguishing between ideas and expressions

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<sup>76</sup> Cf. Ralph F. Folsom & Larry L. Teply, *Trademarked Generic Words*, 89 YALE L.J. 1323, 1324 (1980) (“[C]ourts have assumed that granting or maintaining exclusive rights to generic words would unfairly and injuriously deprive competing manufacturers, consumers, and the public of the right to call an article by its name.”).

<sup>77</sup> These include the fact-expression dichotomy, functionality doctrine, scenes a faire doctrine, and merger. See, e.g., *Feist Publications v. Rural Telephone Service*, 499 U.S. 340 (1991) (holding that copyright extends only to original expression, not to facts); *Brandir Int'l, Inc. v. Cascade Pacific Lumber Co.*, 834 F.2d 1142 (2d Cir. 1987) (addressing the functionality doctrine); *Litchfield v. Spielberg*, 736 F.2d 1352 (9th Cir. 1984) (discussing the scenes a faire doctrine); *Morrissey v. Procter & Gamble Co.*, 379 F.2d 675 (1st Cir. 1967) (describing the merger doctrine).

<sup>78</sup> 17 U.S.C. § 102(b).

<sup>79</sup> See *Nichols v. Universal Pictures Corp.*, 45 F.2d 119, 121 (2d Cir. 1930) (“It is of course essential to any protection of literary property . . . that the right cannot be limited literally to the text, else a plagiarist would escape by immaterial variations.”).

ensures that “raw” ideas remain available to all authors as inputs for the “cooked,” particularized expressions they wish to produce.<sup>80</sup> While others have recognized the close association between the idea-expression dichotomy and intellectual infrastructure,<sup>81</sup> this section provides a fuller account of its doctrinal manifestations.

The seminal case of *Baker v. Selden* illustrates the difference between idea and expression in functional works. There, the Supreme Court considered Selden’s copyright on a book describing a system of double-entry accounting.<sup>82</sup> Selden brought an infringement action against Baker, who had published a slightly different book describing a similar accounting system.<sup>83</sup> The Court found no infringement, holding that Selden’s copyright extended only to the particular expression embodied in his book and not to the *idea* of double-entry accounting.<sup>84</sup> Baker was free to use the ideas underlying Selden’s book, and was only prohibited from copying its expression.

The prohibition against copyrighting ideas gives rise to the doctrine of merger, or the principle that “[w]hen there is essentially only one way to express an idea, the idea and its expression are inseparable and copyright is no bar to copying that expression.”<sup>85</sup> Thus copyright does not inhere in the written rules of a sweepstakes contest because such expression is inseparable from the *idea* of the contest itself.<sup>86</sup> Similarly, because the ideas underlying a manual describing Scrabble strategies are inseparable from the manual’s written expression, only verbatim copying or very close paraphrasing of the

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<sup>80</sup> See Leslie A. Kurtz, *Speaking to the Ghost: Idea and Expression in Copyright*, 47 U. MIAMI L. REV. 1221, 1224 (1993) [hereinafter Kurtz, *Speaking to the Ghost*].

<sup>81</sup> Frischmann, *Economic Theory*, *supra* note 7, at 1002-03; Frischmann & Lemley, *supra* note 10, at 286-90; *cf.* Litman, *supra* note 5, at 967.

<sup>82</sup> 101 U.S. 99 (1879).

<sup>83</sup> *Id.* at 99.

<sup>84</sup> *Id.* at 106.

<sup>85</sup> *Concrete Mach. Co. v. Classic Lawn Ornaments, Inc.*, 843 F.2d 600, 606 (1st Cir. 1988).

<sup>86</sup> *Morrissey v. Procter & Gamble Co.*, 379 F.2d 675 (1st Cir. 1967).

manual itself constitutes infringement.<sup>87</sup> Where a work's particular expression has *merged* with its underlying idea, the author has either a very "thin" copyright in the work or none at all.<sup>88</sup>

The idea-expression dichotomy's most widely-known application comes in the context of literary works. In *Nichols v. Universal Pictures Corp.*, Judge Learned Hand offered "the leading judicial effort" to distinguish uncopyrightable idea from copyrightable expression.<sup>89</sup> In comparing a play and an allegedly infringing movie, Judge Hand presented a framework for separating idea from expression:

Upon any work, and especially upon a play, a great number of patterns of increasing generality will fit equally well, as more and more of the incident is left out. The last may perhaps be no more than the most general statement of what the play is about, and at times might consist only of its title; but there is a point in this series of abstractions where they are no longer protected, since otherwise the playwright could prevent the use of his "ideas," to which, apart from their expression, his property is never extended.<sup>90</sup>

Applying this framework, the court concluded that the only common material of the two works existed at the level of general themes and stock characters, and thus denied the infringement claim.<sup>91</sup>

Related to the idea-expression dichotomy is the scenes a faire doctrine. While courts vary in precisely how they define a "scene a faire"<sup>92</sup> and apply the doctrine,<sup>93</sup> I will focus on the doctrine's underlying principle, which excludes from copyrightability certain "incidents, characters, or setting which are as a practical matter indispensable, or

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<sup>87</sup> *Landsberg v. Scrabble Crossword Game Players, Inc.*, 736 F.2d 485 (9th Cir. 1984).

<sup>88</sup> For a discussion of merger in the computer science context, see *Apple Computer, Inc. v. Franklin Computer Corp.*, 714 F.2d 1240, 1253 (3d Cir. 1983).

<sup>89</sup> *Wiley*, *supra* note 15, at 122.

<sup>90</sup> 45 F.2d 119, 121 (2d Cir. 1930).

<sup>91</sup> *Id.* at 122.

<sup>92</sup> See Kurtz, *The Scenes a Faire Doctrine*, *supra* note 39, at 82.

<sup>93</sup> Michael D. Murray, *Copyright, Originality, and the End of the Scenes a Faire and Merger Doctrines for Visual Works*, 58 BAYLOR L. REV. 779 (2006).

at least standard, in the treatment of a given topic.”<sup>94</sup> For example, in a story about a struggling Bronx police precinct, copyright will not attach to the inclusion of drunks, prostitutes, and derelict cars, unless those elements are somewhat particularized beyond their standard treatments.<sup>95</sup> These stock elements represent the raw materials of creation freely available to all authors. While the scenes a faire doctrine arises conceptually from the idea-expression dichotomy, in some ways it goes beyond it.<sup>96</sup> Significantly, it even preserves in the public domain certain *expressions* that have become so stock, standard, or indispensable that they become infrastructure not subject to exclusive rights.<sup>97</sup>

Recently, the idea-expression dichotomy has played a prominent role in computer software cases.<sup>98</sup> For example, in *Computer Associates, Int’l, Inc. v. Altai, Inc.*, the Second Circuit articulated a three-step abstraction-filtration-comparison test to determine whether a computer program and an alleged copy were substantially similar.<sup>99</sup> The court differentiated between the particularized elements of a software program, which are copyrightable, and general algorithms, which are not.<sup>100</sup> In so doing, the court balanced the interests of protecting innovative works with ensuring “that non-protectable technical expression remains in the public domain for others to use freely as building blocks in their own work.”<sup>101</sup>

As with genericide, the idea-expression dichotomy derives theoretical justification from preventing intellectual monopolies. Ideas, as defined in the copyright context, are

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<sup>94</sup> *Atari, Inc. v. North American Philips Consumer Elecs. Corp.*, 672 F.2d 607, 616 (7th Cir. 1982) (quoting *Alexander v. Haley*, 460 F. Supp. 40, 45 (S.D.N.Y. 1978)).

<sup>95</sup> *Walker v. Time Life Films, Inc.*, 784 F.2d 44 (2d Cir. 1986).

<sup>96</sup> Kurtz, *The Scenes a Faire Doctrine*, *supra* note 39, at 114.

<sup>97</sup> *Id.*

<sup>98</sup> Again, not all circuits have adopted identical approaches to the scenes a faire doctrine in the context of computer works. *See Murray*, *supra* note 93.

<sup>99</sup> 982 F.2d 693, 706–12 (2d Cir. 1992).

<sup>100</sup> *Id.* at 712–26.

<sup>101</sup> *Id.* at 721.

often general and abstract, and seldom have adequate substitutes.<sup>102</sup> Exclusive rights over ideas cast a very long shadow. The merger doctrine prevents copyrighted expression from conferring a monopoly over an idea and all of its manifold elaborations.<sup>103</sup> The scenes a faire doctrine preserves in the public domain “‘stock scenes or scenes that flow[] necessarily from common unprotectable ideas,’ because to hold otherwise would give the first author a monopoly on the commonplace ideas behind the scenes a faire.”<sup>104</sup> Not surprisingly, a lack of adequate substitutes also characterizes many infrastructural assets, such as highways, telephone networks, and language itself, thus rendering monopolistic control of those resources highly problematic.

The idea-expression dichotomy and its related doctrines reflect the principle of intellectual infrastructure. Ideas, like words, are nonrival.<sup>105</sup> Furthermore, abstract ideas such as “love story” and “alien invasion” have value largely as inputs for a wide variety of particularized expressions.<sup>106</sup> As Leslie Kurtz observes, “The idea/expression dichotomy helps copyright strike a balance between providing incentives to create and maintaining the store of raw materials needed for new creations.”<sup>107</sup> These considerations also apply to scenes a faire, which are “elements of creation, a vocabulary needed to create a work.”<sup>108</sup> Underlying the idea-expression dichotomy and concerns about intellectual monopolies is a commitment to creative productivity.<sup>109</sup> The idea-

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<sup>102</sup> See Kurtz, *Speaking to the Ghost*, *supra* note 80, at 1253-58.

<sup>103</sup> *Herbert Rosenthal Jewelry Corp. v. Kalpakian*, 446 F.2d 738, 742 (9th Cir. 1971).

<sup>104</sup> *Landsberg*, 736 F.2d at 489 (quoting *See v. Durang*, 711 F.2d 141, 143 (9th Cir. 1983)) (citation omitted).

<sup>105</sup> See Frischmann, *Economic Theory*, *supra* note 7, at 957-8

<sup>106</sup> See *id.*

<sup>107</sup> Kurtz, *The Scenes a Faire Doctrine*, *supra* note 39, at 83-84.

<sup>108</sup> *Id.* at 114.

<sup>109</sup> *Satava v. Lowry*, 323 F.3d 805, 813 (9th Cir. 2003) (“Only by vigorously policing the line between idea and expression can we ensure both that artists receive due reward for their original creations and that proper latitude is granted other artists to make use of ideas that properly belong to us all.”)

expression dichotomy promotes progress by maintaining incentives to create particularized expressions while preserving open access to the raw materials of creation. As we will see, patent law performs an analogous distinction.

**iii. Patent Law and the Prohibition against Patenting Natural Laws, Physical Phenomena, and Abstract Ideas**

As with trademark and copyright, patent law also distinguishes between intellectual infrastructure and application. Like the idea-expression dichotomy, patent law prohibits patents on certain “raw” ingredients of creation: natural laws, physical phenomena, and abstract ideas.<sup>110</sup>

Unlike trademark and copyright, patent law has no explicit statutory basis for these exclusions. The present patent act defines patentable subject matter as “any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof,” but does not define what is *not* patentable.<sup>111</sup> The prohibition against patenting natural laws, physical phenomena, and abstract ideas thus arises from case law.<sup>112</sup> This prohibition has been deeply influenced by the legislative history of the 1952 Patent Act, which expressed Congress’s intent that patentable inventions “may include anything under the sun that is made by man.”<sup>113</sup> Yet as the Supreme Court held in its seminal 1980 decision in *Diamond v. Chakrabarty*, this expansive language does not

suggest that § 101 [of the Patent Act] has no limits or that it embraces every discovery. The laws of nature, physical phenomena, and abstract ideas have been

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<sup>110</sup> See *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980).

<sup>111</sup> Compare 35 U.S.C. § 101 with 17 U.S.C. § 102(b).

<sup>112</sup> See Lee, *Inverting the Logic of Scientific Discovery*, *supra* note 4, at 92-98 for a more thorough history.

<sup>113</sup> S. REP. NO. 82-1979, at \*5 (1952), *reprinted in* 1952 U.S.C.C.A.N. 2394, 2399.

held not patentable. Thus, a new mineral discovered in the earth or a new plant found in the wild is not patentable subject matter. Likewise, Einstein could not patent his celebrated law that  $E=mc^2$ ; nor could Newton have patented the law of gravity.<sup>114</sup>

As *Chakrabarty* indicates, courts have long disallowed patents on natural laws and physical phenomena. For example, in *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, the Supreme Court considered a patent claiming a combination of various nitrogen-fixing bacteria.<sup>115</sup> The Court rejected the patent, reasoning that the patentee had merely repackaged natural bacteria. The Court distinguished between intellectual infrastructure and application by explaining, “He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end.”<sup>116</sup> While sufficient manipulation of a natural product may yield a patentable invention,<sup>117</sup> the underlying substrate in its natural state is not patentable. In a similar vein, the Second Circuit has famously held that “[e]poch-making ‘discoveries’ of ‘mere’ general scientific ‘laws,’ without more, cannot be patented.”<sup>118</sup>

Patentable subject matter also excludes abstract ideas,<sup>119</sup> an exclusion particularly relevant to computer science.<sup>120</sup> Conceding that “[t]he line between a patentable ‘process’ and an unpatentable ‘principle’ is not always clear,”<sup>121</sup> the Supreme Court has

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<sup>114</sup> 447 U.S. at 309 (citations omitted).

<sup>115</sup> 333 U.S. 127 (1948).

<sup>116</sup> *Id.* at 130.

<sup>117</sup> See *Parke-Davis & Co. v. H.K. Mulford & Co.*, 189 F. 95 (S.D.N.Y. 1911), *aff’d in part and rev’d in part*, 196 F. 496 (2d Cir. 1912) (upholding a patent on an extraction of human adrenaline).

<sup>118</sup> *Katz v. Horni Signal Mfg. Corp.*, 145 F.2d 961, 961 (2d Cir. 1944) (footnote omitted).

<sup>119</sup> *The Rubber-Tip Pencil Co. v. Howard*, 20 Wall. (87 U.S.) 498, 507 (1874); see *Le Roy v. Tatham*, 55 U.S. 156 (1853) (upholding a patent on a process for manufacturing lead pipes, but refusing to construe the patent as covering the *principle* of manufacturing such pipes).

<sup>120</sup> See Julie E. Cohen & Mark A. Lemley, *Patent Scope and Innovation in the Software Industry*, 89 CAL. L. REV. 1, 7-13 (2001).

<sup>121</sup> *Parker v. Flook*, 437 U.S. 584, 589 (1978).

stuck down patents construed as claiming algorithms and mathematical formulae.<sup>122</sup>

While an algorithm cannot be patented, applying that algorithm in the context of a broader process or machine can produce a patentable invention.<sup>123</sup> Most recently, the Federal Circuit has controversially suggested that the threshold patentability analysis hinges solely on “the essential characteristics of the subject matter, in particular, its practical utility.”<sup>124</sup> This decision has encouraged expanded patenting of software and business methods, and has attracted considerable criticism from courts and scholars.<sup>125</sup>

While various rationales justify the prohibition against patenting natural laws, physical phenomena, and abstract ideas,<sup>126</sup> concerns over downstream productive activity loom large. Returning to *Funk Bros.*, the Supreme Court stated, “The qualities of these bacteria, like the heat of the sun, electricity, or the qualities of metals, are part of the storehouse of knowledge of all men. They are manifestations of nature, free to all men and reserved exclusively to none.”<sup>127</sup> In *Gottschalk v. Benson*, the Court recognized that “[p]henomena of nature, though just discovered, mental processes, and abstract intellectual concepts are . . . the basic tools of scientific and technological work.”<sup>128</sup>

These metaphors of storehouses and tools reflect the principle of intellectual

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<sup>122</sup> *Gottschalk v. Benson*, 409 U.S. 63 (1972); *Flook*, 437 U.S. at 595.

<sup>123</sup> *Diamond v. Diehr*, 450 U.S. 175 (1981) (upholding a patent on a process for curing rubber employing the Arrhenius equation).

<sup>124</sup> *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368, 1375 (Fed. Cir. 1998).

<sup>125</sup> See, e.g., *Laboratory Corp. of America Holdings v. Metabolite Lab.*, 126 S. Ct. 2921, 2928 (2006) (“[*State Street*] does say that a process is patentable if it produces a ‘useful, concrete, and tangible result.’ But this Court has never made such a statement and, if taken literally, the statement would cover instances where this Court has held the contrary.”) (Breyer, J., dissenting from dismissal of certiorari); Rochelle Cooper Dreyfuss, *Are Business Method Patents Bad for Business?*, 16 SANTA CLARA COMPUTER & HIGH TECH. L.J. 263 (2000); Alan L. Durham, “Useful Arts” in the Information Age, 1999 B.Y.U. L. REV. 1419 (1999); John R. Thomas, *The Patenting of the Liberal Professions*, 40 B.C. L. REV. 1139 (1999).

<sup>126</sup> Eileen Kane, *Patent Ineligibility: Maintaining a Scientific Public Domain*, 80 ST. JOHN’S L. REV. 519, 545 (2006).

<sup>127</sup> 333 U.S. at 130.

<sup>128</sup> 409 U.S. 63, 67 (1972).

infrastructure, where upstream assets are maintained in the public domain for use in downstream applications.<sup>129</sup>

As with trademark and copyright, the flip side of courts preserving intellectual infrastructure in the public domain is a concern over monopolies.<sup>130</sup> The *Funk Bros.* court explicitly warned against monopolies over natural phenomena.<sup>131</sup> *Brenner v. Manson*, a case focusing on the utility requirement rather than patentable subject matter per se, is also illustrative in this regard.<sup>132</sup> There the Supreme Court applied the “general intent of Congress” and “the purposes of the patent system” in denying a patent on a process for creating chemical compounds of no known utility, but which might be useful in subsequent research.<sup>133</sup> The Court explained that upholding the patent would be improper because the “metes and bounds of that monopoly are not capable of precise delineation . . . . Such a patent may confer power to block off whole areas of scientific development, without compensating benefit to the public.”<sup>134</sup> Similar concerns counsel against allowing patents on intellectual infrastructure.

In 2006, the Supreme Court dismissed the writ of certiorari in *Laboratory Corp. of America Holdings v. Metabolite Labs. Inc.* as improvidently granted.<sup>135</sup> This left undisturbed a Federal Circuit decision upholding a patent on a process for diagnosing

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<sup>129</sup> Lee, *Inverting the Logic of Scientific Discovery*, *supra* note 4, at 108-09.

<sup>130</sup> Courts frequently employ the term “monopoly” differently from the strict economic meaning of the term, which involves exercising market power. In most cases, sufficient substitutes for patented products exist to prevent a monopoly. Because natural laws, physical phenomena, and abstract ideas lack substitutes, granting patents on such resources would likely confer market power on the patentee, thus facilitating a monopoly.

<sup>131</sup> 333 U.S. at 130.

<sup>132</sup> 383 U.S. 519 (1966).

<sup>133</sup> *Id.* at 532.

<sup>134</sup> *Id.* at 534.

<sup>135</sup> 126 S. Ct. 2921 (Mem) (2006).

vitamin deficiencies from elevated levels of homocysteine in the human body.<sup>136</sup> Many commentators had viewed this case as a valuable opportunity to clarify the patentability of natural principles and ideas. In his dissent from the dismissal of the writ of certiorari, Justice Breyer noted that “sometimes *too much* patent protection can impede rather than ‘promote the Progress of Science and useful Arts.’”<sup>137</sup> This observation highlights the functional concern at the heart of the exclusion of natural laws, physical phenomena, and abstract ideas from patentability.<sup>138</sup> These assets all satisfy the criteria for intellectual infrastructure described above.<sup>139</sup> They are nonrival<sup>140</sup> and derive immense value as enablers of a wide variety of downstream, particularized applications. Preserving this infrastructure in the public domain facilitates downstream invention and ultimately advances the utilitarian objectives of the patent system.<sup>141</sup>

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<sup>136</sup> *Id.*

<sup>137</sup> *Id.* at 2922 (Breyer, J., dissenting) (citation omitted).

<sup>138</sup> Justice Breyer’s dissent parallels the erosion of sharing norms in research science that has been correlated with the rise of patenting in basic science. See THOMAS MERTON, *THE SOCIOLOGY OF SCIENCE*; Rebecca S. Eisenberg, *Proprietary Rights and the Norms of Science in Biotechnology Research*, 97 *YALE L.J.* 177 (1987); but see Robert P. Merges, *Property Rights Theory and the Commons: The Case of Scientific Research*, 13 *SOC. PHIL. & POL’Y* 148 (1996) (noting that informal sharing norms continue against a backdrop of formal patent rights).

<sup>139</sup> Frischmann, *Economic Theory*, *supra* note 7, at 956.

<sup>140</sup> Physical phenomena, such as all the members of an endangered species, can be scarce and therefore rivalrous. However, any patent claiming physical phenomena does not claim the physical manifestations of these entities, but somewhat abstracted blueprints of them. These blueprints are nonrival.

<sup>141</sup> But see R. Polk Wagner, *Information Wants to be Free: Intellectual Property and the Mythologies of Control*, 103 *COLUM. L. REV.* 995, 995 (2003). Wagner argues that “information wants to be free,” and that increased copyrighting and patenting will inevitably enrich the public domain because every creation provides second- and third-order information about itself that cannot be controlled. *Id.* at 1002 -07. Examples of this “derivative,” non-propertizable information include abstract ideas, scientific principles, and settings of creative works. *Id.* at 1007. Crucially, these assets largely correlate with the elements that genericity, the idea-expression dichotomy, and patentable subject matter doctrine are intended to preserve in the public domain. Propertization of these assets would undermine the supposed benefit of derivative information, thus corroborating concerns that expansive intellectual property rights are impoverishing the public domain.

Although patent and copyright are more similar to each other than to trademark, they all in some way preserve open access to “raw” infrastructure and extend protection only to “cooked” applications.<sup>142</sup> Maintaining infrastructural assets such as generic words, ideas, and natural principles in the public domain advances commercial, creative, and inventive activity. This doctrinal tour has revealed how infrastructure is defined functionally in order to advance overarching utilitarian aims. Accordingly, as circumstances change, the definition (and legal treatment) of infrastructure should also change as well in order to best perform its intended function. To help understand how infrastructure and the dividing line between private and public property evolves, I will take a brief foray into the realm of real property.

## **Part II. The Socially Contingent Nature of Infrastructure and its Evolution**

In understanding the infrastructural nature of words, ideas, and natural principles, Carol Rose’s work on inherently public property and Roman roads is particularly helpful.<sup>143</sup> Rose’s earlier work, responding to law and economics scholarship that generally favors private property, explores the peculiar and persistent phenomenon of “inherently public property.”<sup>144</sup> This class of real property includes roadways, waterways, and more recently, beachfront property, which courts and commentators have

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<sup>142</sup> These doctrines share another interesting similarity: they all deal with abstraction. Judge Hand explicitly defines ideas as more abstract than expressions. Nichols, 45 F.2d at 121. Similarly, generic trademarks are problematic because they have become abstractions; they signify an entire class of products instead of a particularized member of that class. Analogously, an invention, if subjected to a “great number of patterns of increasing generality,” could be conceptualized as a combination of scientific principles and mechanical forces. *Id.* At this level of abstraction, exclusive rights are prohibited.

<sup>143</sup> Rose, *The Comedy of the Commons*, *supra* note 12; Carol Rose, *Romans, Roads, and Romantic Creators: Traditions of Public Property in the Information Age*, 66 LAW & CONTEMP. PROBS. 89 (2003) [hereinafter Rose, *Romans*]; see Frischmann, *Economic Theory*, *supra* note 7, at 928.

<sup>144</sup> Rose, *The Comedy of the Commons*, *supra* note 12, at 712-17.

perceived as public.<sup>145</sup> Although Rose did not frame her inquiries into inherently public property in terms of infrastructure, many of the assets that she describes fit that description.<sup>146</sup> Her observations reveal how social practice and community norms can transform private property to property that is subject to greater public access, and in some cases, ownership.

Within Frischmann's theoretical framework, assets such as roads, waterways, and even open spaces for communal events<sup>147</sup> qualify as infrastructure. These assets are generally nonrival (subject to constraints of capacity and congestion) and generate value (from the perspective of productive exploitation) largely as facilitators of subsequent activity.<sup>148</sup> Inherently public property exhibits another characteristic of infrastructure: increasing returns to scale.<sup>149</sup> As Rose elaborates, assets such as roads, waterways, and fields for public dances reflect a "comedy of the commons"<sup>150</sup> rather than the traditional "tragedy of the commons" associated with communal ownership.<sup>151</sup> For these assets, "the more the merrier."<sup>152</sup> The larger the number of participants who exploit a resource, as in a dance in a public field, the more fun is enjoyed by all. Furthermore, the unique attributes of these assets suggest the appropriate property regime for controlling them; open access is often the best mechanism for generating the significant positive externalities associated with inherently public property. Accordingly, eschewing the

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<sup>145</sup> *Id.*

<sup>146</sup> In her later work, Rose describes Roman roads as infrastructure, comparing them to the Internet. Rose, *Romans*, *supra* note 143, at 100-01. See also Brett Frischmann, *Privatization and Commercialization of the Internet Infrastructure: Rethinking Market Intervention into Government and Government Intervention into the Market*, 2 COLUM. SCI. & TECH. L. REV. 1 (June 8, 2001), <http://stlr.org/cite.cgi?volumeW2&articleW1>.

<sup>147</sup> See Rose, *The Comedy of the Commons*, *supra* note 12, at 717, 758-61.

<sup>148</sup> Frischmann, *Economic Theory*, *supra* note 7, at 957.

<sup>149</sup> Rose, *The Comedy of the Commons*, *supra* note 12, at 768-70; see Frischmann, *Economic Theory*, *supra* note 7, at 928.

<sup>150</sup> Rose, *The Comedy of the Commons*, *supra* note 12, at 768.

<sup>151</sup> See Garrett Hardin, *The Tragedy of the Commons*, 162 SCIENCE 1243 (1968).

<sup>152</sup> Rose, *The Comedy of the Commons*, *supra* note 12, at 768.

dyad of private versus governmental ownership, Rose explains how inherently public property is “owned” by a third entity: the unorganized public at large.<sup>153</sup>

The parallels between inherently public property and intellectual infrastructure are striking.<sup>154</sup> We have already discussed the nonrivalrous nature of intellectual infrastructure and how its value resides chiefly in facilitating productive activity.<sup>155</sup> Beyond that, intellectual infrastructure also enjoys increasing returns to scale: the more exploitation of words, ideas, and natural principles, the merrier.<sup>156</sup> As such, as with inherently public property, open access based on ownership by the public at large characterizes intellectual infrastructure. The link between inherently public property and infrastructure is even more explicit in Rose’s study of Roman roads. Rose’s typology of nonexclusive property under ancient Roman law includes “res publicae,” which include things that are open and belonging to the public by operation of law, such as roads, bridge, and rivers.<sup>157</sup> One “especially critical factor” in ensuring that these assets are open to the public is “the presence of wide-ranging synergies, or what are now called network effects.”<sup>158</sup> Although Rose analogizes Roman roads to the Internet,<sup>159</sup> one could also analogize Roman roads to the intellectual infrastructure embodied in generic words, abstract ideas, and natural phenomena. Like roads, these assets generate positive

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<sup>153</sup> *Id.* at 721.

<sup>154</sup> Frischmann, *Economic Theory*, *supra* note 7, at 928.

<sup>155</sup> *See supra* Part I.A.

<sup>156</sup> *Cf.* *Landsberg v. Scrabble Crossword Game Players, Inc.*, 736 F.2d 485, 488 (9th Cir. 1984) (recognizing a “strong policy permitting all to use freely the ideas contained in a copyrighted work so long as copyrighted expression is not appropriated”).

<sup>157</sup> Rose, *Romans*, *supra* note 143, at 96-100.

<sup>158</sup> *Id.* at 97. These assets were also open to the public by operation of law because of their inherent ease of private appropriation. Roads and waterways are long and thin, and “vulnerable to many possibilities for obstruction and bottlenecks.” *Id.* at 97. Arguably, it is here that the analogy to generic words, abstract ideas, and natural phenomena is weakest, for these assets, unlike a physical road, are not inherently easily appropriated. However, as Rose herself acknowledges, network effects, not excludability, are the most important factor justifying the publicly accessible character of roads, rivers, and other infrastructural assets.

<sup>159</sup> Rose, *Romans*, *supra* note 12, at 100-02.

externalities and exhibit what can be called infrastructure effects.<sup>160</sup> These assets are all valuable as means to a wide variety of ends.<sup>161</sup>

As with intellectual infrastructure, private ownership of inherently public property raises the familiar specter of monopolies. Private ownership of roads and waterways enables individual holdouts that can hold up socially productive activity.<sup>162</sup> The general lack of adequate alternatives to infrastructure like roads and waterways helps render exclusive rights over them so potentially damaging. Similarly, ownership of intellectual infrastructure could enable vast, destructive monopolies. To mitigate the threat of holdouts in the real property realm, various mechanisms have developed to transform the legal character of assets from private to public, such as eminent domain, public prescription, the public trust doctrine, and perhaps most relevant for our purposes, custom.<sup>163</sup>

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<sup>160</sup> While Rose refers to network effects, Frischmann distinguishes between network effects and infrastructure effects. Network effects arise when a resource's value increases as more people use it—such as when one person's purchase of a telephone enhances the value of the entire network. Network effects are likely to be appropriable by owners of the network, who will be willing to pay a higher price because of them to access the network. Infrastructure effects, by comparison, involve more far-ranging externalities (often involving public goods) that are not fully appropriable by those using the infrastructure. As such, infrastructure effects will not necessarily increase users' willingness to pay for access to infrastructure. Frischmann, *Economic Theory*, *supra* note 7, at 972-73.

<sup>161</sup> Rose's study of Roman roads as infrastructure also relates to contemporary commons-based peer production, which is marked by decentralized networks of individuals utilizing commonly accessible assets to contribute to some value creating program. See Yochai Benkler, *Coase's Penguin, or, Linux and the Nature of the Firm*, 112 YALE L.J. 369 (2002). For example, a multitude of software developers independently contributing to open source code have created the Linux operating system. Peer production relies on a commons, and challenges the hegemony of linear production models where a single entity controls access to capital and coordinates the activities of workers. As with Linux, intellectual infrastructure—generic words, abstract ideas, natural laws and phenomena—are also open source, thus allowing their most productive exploitation by the “disorganized public” at large.

<sup>162</sup> Rose does not address licensing, which could theoretically allow access to an infrastructural resource while still maintaining an individual's ownership rights. However, licensing to all prospective users of inherently public property is generally not feasible, and provides too unstable a basis for securing public access. Preventing actual and threatened holdouts requires actually changing the legal characterization of property (or at least rights to use that property) from private to public.

<sup>163</sup> Rose, *The Comedy of the Commons*, *supra* note 12, at 749-50.

One of Rose's most powerful insights concerns the sensitivity of legal classifications of inherently public property to evolving social practice and cultural norms. This is evident from the doctrine of public easements, where the public's repeated use of private land can ripen into a right of use that is permanent and hostile to the property owner.<sup>164</sup> This is also apparent in the public trust doctrine, which, among other functions, has traditionally provided access to communal areas such as the foreshore of beaches.<sup>165</sup> Courts have extended this doctrine to include the adjacent sandy beach in order to facilitate activities such as sunbathing that earlier generations did not privilege as important.<sup>166</sup>

Custom is particularly relevant to illustrating how social practice can create public rights of access to private property. Rose describes how the custom of holding communal dances on a particular plot of land can confer on that land the status of inherently public property.<sup>167</sup> Here, reliance interests built up by the public, which may have been arbitrary in their genesis, nevertheless trump the seemingly legitimate interests of the private landowner. Rose notes, "Thus the location of customary public activities may matter a great deal, not because it would be impossible to conduct these activities elsewhere, but because to relocate would rupture the continuity of the community's experience and diminish the significance of the activity itself."<sup>168</sup> Rose goes on to observe that "habit, expectation, custom, perhaps tied to a variety of community practices, may make property hostage to private 'holdout' power. The public's custom of dancing and carousing in a particular place, like its habit of traveling on certain paths,

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<sup>164</sup> See generally JESSE DUKEMINIER ET AL., PROPERTY 699-701 (6th ed. 2006).

<sup>165</sup> *Matthews v. Bay Head Improvement Assoc.*, 471 A.2d 355 (N.J. 1984).

<sup>166</sup> *Id.* at 369.

<sup>167</sup> Rose, *The Comedy of the Commons*, *supra* note 12, at 659-61.

<sup>168</sup> *Id.* at 759.

makes these various lands essential.”<sup>169</sup> Widespread social use and reliance can change the character of property from private to public. In similar fashion, once society has evolved to a point where it derives great value from exploiting an infrastructural resource, the claim of the property owner over that resource may become attenuated.

Rose’s inquiries into the socially contingent definition of infrastructure offer a valuable contribution to the well-established scholarship on communal norms.<sup>170</sup> Early norms scholarship highlighted the role of cultural norms and non-state actors in resolving disputes and managing communal resources without recourse to formal legal rules.<sup>171</sup> However, the phenomenon of inherently public property reveals how cultural norms and social practice themselves become instantiated in legal rules.<sup>172</sup> This Article extends this view to illustrate how legal designations of infrastructure in the intellectual property realm also accommodate changing social practice, reliance interests, and norms.

Infrastructure evolves, both socially and legally. As a community comes to continuously rely on access to a resource such as a road or open field, that resource may attain infrastructural status. In certain cases, the law responds to this social reliance by granting public rights over otherwise private property. Similarly, intellectual infrastructure also evolves. Language shifts as people use trademarked terms as generic words. The set of “stock” elements necessary to tell communally-recognizable stories changes over time. And the basic suite of infrastructural assets necessary to invent in a given field shifts as technology progresses. If infrastructure is both socially defined and

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<sup>169</sup> *Id.* at 760.

<sup>170</sup> For an overview of law-and-norms theory, see Arti Kaur Rai, *Regulating Scientific Research: Intellectual Property Rights and the Norms of Science*, 94 NW. U.L. REV. 77, 81-88 (1999).

<sup>171</sup> *Id.* at 81-84; see, e.g., ROBERT ELLICKSON, *ORDER WITHOUT LAW* (1999); ELINOR OSTROM, *GOVERNING THE COMMONS* (1990).

<sup>172</sup> Rai, *supra* note 170, at 84.

warrants legal treatment different from other types of property, then the legal designation of infrastructure should change with changing social practices and demands. The question remains as to how well trademark, copyright, and patent law doctrines defining intellectual infrastructure accommodate this evolution.

### **Part III. Accommodating the Evolution of Intellectual Infrastructure**

When comparing trademark, copyright, and patent on how they accommodate the evolution of intellectual infrastructure, an interesting continuum emerges. Designations of intellectual infrastructure in trademark are highly responsive to social evolution, as genericide relies on changing consumer perceptions to determine when a trademark has become a generic word. Copyright is also sensitive to evolving norms, though in a more subtle way. The idea-expression dichotomy and the scenes a faire doctrine accommodate the creative community's evolving need for infrastructure by recognizing freely-appropriable "ideational content" in elements that are common, stock, or standard. Patent law takes the narrowest and most rigid approach to defining intellectual infrastructure. While courts recognize that the excludability of natural laws, physical phenomena, and abstract ideas serves the functional role of keeping basic infrastructure in the public domain, they have not extended these doctrines to recognize that certain patented technologies themselves may become intellectual infrastructure, and achieve this status well before expiration of the patent term. Unlike trademark and copyright, patent law does not recognize that certain creations become so cooked that they should be considered raw.

### A. Trademark: Sensitivity to Changing Social Practice

The 1946 Lanham Act, which establishes the statutory basis for federal trademark law,<sup>173</sup> distinguishes among four categories of marks: 1) arbitrary or fanciful;<sup>174</sup> 2) suggestive;<sup>175</sup> 3) descriptive;<sup>176</sup> and 4) generic.<sup>177</sup> As mentioned, 15 U.S.C. § 1064(3) authorizes cancellation of a mark if it becomes the generic name for the good or service for which it is registered.<sup>178</sup> Within this test, the “primary significance of the registered mark to the relevant public” determines whether the mark is legally generic.<sup>179</sup>

This statutory framework highlights several notable elements of the genericity test. First, genericity is highly sensitive to evolving consumer perceptions of the meaning of a word or phrase. In the seminal case of *Bayer Co. v. United Drug Co.*, the Southern District of New York considered Bayer’s claimed trademark on the word “aspirin.”<sup>180</sup> Focusing solely on the factual question of how buyers understood the term in question,<sup>181</sup> the court concluded that for lay consumers, “aspirin” had entered the vernacular as a

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<sup>173</sup> The Trademark Act of 1946 (Lanham Act), 60 Stat. 427, as amended, 15 U.S.C. § 1051 *et seq.*

<sup>174</sup> Arbitrary marks have little or no relationship to the products that bear them, e.g., “Apple” computers. Fanciful or “coined” marks are fabricated neologisms, such as “Doritos” snack chips.

<sup>175</sup> Suggestive marks convey some information about a product without actually describing it, such as “Microsoft” software.

<sup>176</sup> Descriptive marks describe the product or one of its important characteristic, such as “Sharp” televisions.

<sup>177</sup> *See* *Abercrombie & Fitch Co. v. Hunting World, Inc.*, 537 F.2d 4, 9 (2d Cir. 1976).

<sup>178</sup> 15 U.S.C. § 1064(3).

<sup>179</sup> *Id.* This language comes from the Trademark Clarification Act of 1984. As courts have noted, this standard adopted the test of genericness articulated in *Bayer Co. v. United Drug Co.*, 272 F. 505 (S.D.N.Y. 1921). *Magic Wand, Inc. v. RDB, Inc.*, 940 F.2d 638, 640 (Fed. Cir. 1991).

<sup>180</sup> *Bayer*, 272 F. at 509.

<sup>181</sup> *Id.*

generic word.<sup>182</sup> As such, it was inappropriate for a single firm to exercise exclusive rights over such a term.

Courts have adopted a three-part test within which a party asserting genericity must: 1) identify the product class for which the mark is relevant; 2) identify the relevant purchasing community for that product; and 3) prove that the primary significance of the trademark is to identify the *class* of products to which the mark relates.<sup>183</sup> Crucially, to determine primary significance, courts rely on social data such as consumer testimony, surveys, dictionaries, newspapers, and other publications to demonstrate what the consuming public actually understands a given trademark to mean.<sup>184</sup>

For example, in *Kellogg Co. v. National Biscuit Co.*, the Supreme Court ruled that “shredded wheat” was generic, relying on evidence that “[e]ver since 1894 the article has been known to the public as shredded wheat.”<sup>185</sup> Similarly, in *Dixi-Cola Laboratories v. Coca-Cola Co.*, the Fourth Circuit rejected Coca-Cola’s claim to a trademark on the word “cola,” noting widespread use of this term by competitors.<sup>186</sup> More recently, in *Glover v. Ampak, Inc.*, the Fourth Circuit upheld a trademark on “White Tail” hunting knives, noting that “[t]here is no testimony . . . that ‘White Tail’ was a term generically used for pocket knives.”<sup>187</sup> In many cases, litigants present quantified market data about consumer perceptions, as in *King-Seeley Thermos Co. v. Aladdin Industries, Inc.*<sup>188</sup> In ruling that “thermos” was generic, the court cited one market survey indicating that only about 12% of the American public knew that the word “thermos” had any trademark

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<sup>182</sup> *Id.* at 514

<sup>183</sup> *Glover v. Ampak, Inc.*, 74 F.2d 57, 59 (4th Cir. 1996).

<sup>184</sup> *Magic Wand*, 940 F.2d at 641; *see* 2 J. THOMAS MCCARTHY, MCCARTHY ON TRADEMARKS AND UNFAIR COMPETITION § 12:13 (4th ed. 2006)

<sup>185</sup> 305 U.S. 111, 113 (1938).

<sup>186</sup> 117 F.2d 352, 360 (4th Cir. 1941).

<sup>187</sup> 74 F.3d 57, 60 (4th Cir. 1996).

<sup>188</sup> 321 F.2d 577 (2d Cir. 1963).

significance.<sup>189</sup> The court further noted that by the early 1950s, the generic use of “thermos” had grown significantly in non-trade publications and that it had become basically synonymous with vacuum insulated container.<sup>190</sup>

Within the genericide framework, the trademark holder’s efforts to “police” usage of the mark and retain its particularized character are irrelevant.<sup>191</sup> Thus in *Bayer*, the plaintiff’s expenditure of “large sums of money” in marketing aspirin could not prevent the loss of trademark status.<sup>192</sup> In an irony at the heart of genericide, Bayer was a victim of its own success.<sup>193</sup> A typical firm’s “marketing goal is to build brand dominance to the point of ubiquity, so that the brand is the first thing on a consumer’s mind when considering a purchase of a particular type of good.”<sup>194</sup> However, perfect execution of this strategy may backfire if the mark becomes the de facto means of signifying the class to which the product belongs. If it does so, then the public establishes an easement over this infrastructural asset that the firm must accommodate.

The second notable feature of genericity analysis is its deeply contextual nature. A mark may be arbitrary for one product but generic for another because of differences in use over time, among multiple groups, and even among various uses of the same product.<sup>195</sup> For example, the word “apple” is generic in the produce industry, but a particularized trademark in the computer industry.<sup>196</sup> Courts thus take a highly

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<sup>189</sup> *Id.* at 579-80.

<sup>190</sup> *Id.* at 579.

<sup>191</sup> *See* *Abercrombie*, 537 F.2d at 9.

<sup>192</sup> 272 F. at 505.

<sup>193</sup> The court observed that “an extended course of education” of the public might have created the requisite secondary meaning to maintain aspirin as a trademark. 272 F. at 512. Despite, or perhaps because, of Bayer’s marketing efforts, this secondary meaning did not arise.

<sup>194</sup> Deven R. Desai & Sandra L. Rierson, *Confronting the Genericism Conundrum*, 28 *CARDOZO L. REV.* 1789, 1790 (2007).

<sup>195</sup> *Abercrombie*, 537 F.2d at 9. *See id.* at 11.

<sup>196</sup> *See* *America Online, Inc., v. AT&T Corp.*, 243 F.3d 812, 820 (4th Cir. 2001).

contextual approach to genericity, distinguishing among the perceptions of various consumer communities. In *Bayer*, the court differentiated between chemists, physicians, and druggists, who were aware that aspirin was Bayer's particular product, and lay consumers, for whom aspirin was generic.<sup>197</sup> This difference in perception led to a highly tailored remedy. The *Bayer* court allowed the alleged infringer, United Drug, to use "aspirin" in its marketing to the general public. However, the court enjoined United Drug from using "aspirin" in direct sales with chemists, physicians, and druggists. Because of their specialized knowledge, these consumers might be misled if United Drug marketed its product under the same name used by Bayer.<sup>198</sup>

More recent cases also reflect the factually intensive and contextual nature of genericity analysis. In *America Online v. AT&T*, the Fourth Circuit relied on historical usage, consumer perception, and even publications such as *America Online for Dummies* to conclude that the phrase "You Have Mail" is generic.<sup>199</sup> In *Hickory Farms, Inc. v. Snackmasters, Inc.*, the Northern District of Illinois likewise considered "competitors' use, plaintiffs' use, dictionary definitions, media usage, testimony of persons in the trade, and consumer surveys" in concluding that the phrases "beef stick" and "turkey stick" were generic.<sup>200</sup> Hickory Farms's considerable expenditures on advertising its products as beef sticks and turkey sticks were irrelevant, as those terms had entered the vernacular.<sup>201</sup>

In sum, genericity is explicitly functional in defining intellectual infrastructure. Starting from the premise that generic words are intellectual infrastructure and

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<sup>197</sup> 272 F. at 505.

<sup>198</sup> *Id.* at 514.

<sup>199</sup> 243 F.3d at 819-21.

<sup>200</sup> 2007 WL 772919 (N.D. Ill. 2007).

<sup>201</sup> *Id.* at \* 7.

inappropriate as trademarks, the doctrine relies on social data such as consumer surveys, market reports, sales materials, brochures, and dictionaries to determine whether the relevant consuming public has come to understand a mark as generic. These social data may reveal a reality that genericide is designed to make legally relevant: that “cooked” marks, even those completely fabricated by individual firms, can become the “raw,” generic mechanisms by which the public refers to entire product categories. Throughout this process, any investments the trademark holder made to maintain the mark’s particularized status are irrelevant.<sup>202</sup> Although the doctrine is not immune from criticism,<sup>203</sup> genericity’s responsiveness to evolving social norms and its ability to facilitate context-specific remedies help it achieve the utilitarian goals of the trademark system.<sup>204</sup> Exclusive rights over generic words may inhibit competition, and genericide addresses this problem in a dynamic, targeted fashion.

## **B. Copyright: Privileging Stock and Standard Expression**

Courts utilize the idea-expression dichotomy to maintain the free availability of creative infrastructure in the public domain. While genericide’s sensitivity to evolving social practice is explicit, copyright operates more subtly. Copyright accommodates evolving social practice in two related ways. First, along the continuum between idea and expression, courts are more likely to attach the label of nonprotectable idea to an

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<sup>202</sup> Xerox has engaged in a well-known advertising campaign to stop consumers from using its trademark as a generic term.

<sup>203</sup> See Desai & Rierson, *supra* note 194, at 1790 (arguing that genericism should focus more narrowly on a mark’s ability to identify a source in commercial contexts, notwithstanding noncommercial uses of the mark).

<sup>204</sup> See Hans Zeisel, *The Surveys that Broke Monopoly*, 50 U. CHI. L. REV. 896, 898 (1983).

element of a work that is common. Thus, society's repeated use of what could arguably be categorized as an expression will help inch that element towards non-protectability. Second, in a more direct fashion, the scenes a faire doctrine transmutes expressions that are stock or indispensable into non-protectable elements residing in the public domain. Through these processes, copyright recognizes that widespread use of "cooked" expressions can render them "raw" materials for subsequent creation. Consequently, copyright dynamically accommodates the creative community's need to access intellectual infrastructure as that infrastructure evolves.

The idea-expression dichotomy arises in the context of comparing an original and allegedly infringing work for substantial similarity. While courts differ on the exact application of the idea-expression dichotomy,<sup>205</sup> at some point in the substantial similarity test, courts filter out unprotectable elements from the original work and compare only its protectable *expression* with the allegedly infringing work.<sup>206</sup> Courts must thus separate the underlying ideas of a work from protectable expression.<sup>207</sup>

While the phrase "idea-expression dichotomy" suggests that various elements of a work neatly fall within one category or another, such is far from the case.<sup>208</sup> As Judge Hand candidly acknowledged in describing his abstractions test, any line between idea and expression is inherently arbitrary.<sup>209</sup> Other courts as well have recognized that the

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<sup>205</sup> Kurtz, *Speaking to the Ghost*, *supra* note 80, at 1233-34.

<sup>206</sup> Circuits differ on whether they distinguish nonprotectable from protectable elements during the initial comparison to establish factual copying and whether the ultimate test for substantial similarity compares the total works or only protectable elements of the works.

<sup>207</sup> For a fascinating discussion of the historical and philosophical roots of the idea-expression dichotomy, see Amy B. Cohen, *Copyright Law and the Myth of Objectivity: The Idea Expression Dichotomy and the Inevitability of Artistic Value Judgments*, 66 *IND. L.J.* 175, 198-209 (1990).

<sup>208</sup> Kurtz, *Speaking to the Ghost*, *supra* note 80, at 1222.

<sup>209</sup> Nichols, 45 F.2d at 122 ("While we are as aware as any one that the line, wherever it is drawn, will seem arbitrary, that is no excuse for not drawing it."); see *Nash v. CBS*, 899 F.2d 1537, 1540 (7th Cir. 1990)

distinction between idea and expression is “elusive”<sup>210</sup> and “faint.”<sup>211</sup> Scholars, too, have pointed out the analytical deficiencies of the idea-expression dichotomy, which represents “[t]he most notorious problem in copyright law.”<sup>212</sup> This doctrine contains no a priori definition of “idea,” thus preventing courts from applying it in a principled, rigorous manner.<sup>213</sup> As commentators have noted, the arbitrariness of the idea-expression dichotomy renders it vulnerable to application based on personal idiosyncrasies and subjective estimations of artistic merit.<sup>214</sup>

The absence of an objective framework for distinguishing a work’s ideas and expressions leaves open the question of how exactly courts make these determinations. It is here that the connection between the idea-expression dichotomy and copyright’s accommodation of evolving intellectual infrastructure begins to become apparent. Specifically, in the absence of a priori definitions of “idea” and “expression,” courts apply the idea-expression dichotomy in a *functional* manner to best promote creative progress. The phrase idea-expression “dichotomy” is a misnomer, for it really describes a continuum. Within this continuum, application of the idea-expression dichotomy is a policy judgment, similar to determining proximate cause in tort cases. Courts calibrate where an element of a creative work falls along this continuum in order to strike the best balance between granting exclusive rights and preserving a robust public domain. While

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(noting that Judge Hand’s test is “not a ‘test’ at all. It is a clever way to pose the difficulties that . . . does little to help resolve a given case . . .”).

<sup>210</sup> Williams v. Crichton, 84 F.3d 581, 587-88 (2d. Cir. 1996).

<sup>211</sup> Satava v. Lowry, 323 F.3d 805, 807 (9th Cir. 2003).

<sup>212</sup> Wiley, *supra* note 15, at 121; *see* Kurtz, *Speaking with the Ghost*, *supra* note 80, at 1222; Kurtz, *The Scenes a Faire Doctrine*, *supra* note 39, at 85 (characterizing the idea-expression dichotomy as subjective and ad hoc).

<sup>213</sup> Alfred C. Yen, *A First Amendment Perspective of the Idea/Expression Dichotomy and Copyright in a Work’s Total Concept and Feel*, 38 EMORY L.J. 393, 403 (1989).

<sup>214</sup> Amy B. Cohen, *supra* note 207, at 178.

this approach is subject to criticisms of subjectivity,<sup>215</sup> it allows courts to preserve as non-protectable certain elements that society, through widespread use and reliance, has come to regard as infrastructural.

In some cases, courts' functional application of the idea-expression dichotomy is quite explicit. In *Herbert Rosenthal Jewelry Corp. v Kalpakian*, the Ninth Circuit considered the alleged copying of a jewel-encrusted bee pin.<sup>216</sup> In applying the idea-expression dichotomy, the court noted that the "guiding consideration in drawing the line is the preservation of the balance between competition and protection reflected in the patent and copyright laws."<sup>217</sup> Thus while "idea" and "expression" ostensibly represent objective categories with a priori definitions, the court here recognized that instrumental aims explicitly define idea versus expression. *Herbert Rosenthal* is remarkably candid: "We think the production of jeweled bee pins is a larger private preserve than Congress intended to be set aside in the public market without a patent. A jeweled bee pin is *therefore* an 'idea' that defendants were free to copy."<sup>218</sup> Here, the cart comes before the horse. Jewel-encrusted bee pins do not satisfy some objective definition of "idea." Rather, they are ideas because treating them as such promotes creative progress. This is a strictly *functional*, rather than formal, definition of idea.<sup>219</sup>

This functional approach to distinguishing nonprotectable ideas from protectable expressions is sensitive to social evolution in two ways. First, along the continuum

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<sup>215</sup> See *id.*

<sup>216</sup> 446 F.2d 738 (9th Cir. 1971).

<sup>217</sup> *Id.* at 742.

<sup>218</sup> *Id.* (emphasis added).

<sup>219</sup> See also *Whelan Assoc., Inc. v. Jaslow Dental Laboratory, Inc.*, 797 F.2d 1222, 1225 (3d Cir. 1986) ("[P]recisely because the line between idea and expression is elusive, we must pay particular attention to the pragmatic considerations that underlie the distinction and copyright law generally. In this regard, we must remember that the purpose of the copyright law is to create the most efficient and productive balance between protection (incentive) and dissemination of information, to promote learning, culture, and development.").

between idea and expression, courts are more likely to construe commonplace elements of creative works as “ideas.”<sup>220</sup> While this appears intuitively defensible, upon further reflection it becomes clear that just because something is common does not make it an idea. However, equating commonplace elements with nonprotectable “ideas” is fully consistent with copyright’s aim of maintaining open access to the building blocks of creative work. Thus in *Mattel, Inc. v. Azrak-Hamway Int’l, Inc.*, the Second Circuit affirmed the district court’s finding of no infringement regarding two action figures exhibiting a similar crouching stance.<sup>221</sup> Central to the court’s holding was its finding that the plaintiff’s figures displayed an “unprotectable idea—a superhuman muscleman crouching in what since Neanderthal times has been a traditional fighting pose.”<sup>222</sup> The court did not find that the fighting crouch was a once-copyrightable expression whose term had expired, thus relegating it to the public domain. Instead, the court found that the crouch was an *idea* itself. While, analytically, one could just as easily categorize the crouch as an expression, the fact that society has used this depiction repeatedly contributed to the court’s conclusion that it was an “idea,” or more precisely, non-protectable.

Other cases further illustrate this equation of “standard” or “commonplace” elements with non-protectable ideas. In *Quaker Oats Co. v. Mel Appel Enterprises*, the Southern District of New York compared two stuffed toy dogs for substantial similarity.<sup>223</sup> The court rejected the defendant’s argument that the dolls’ similarities

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<sup>220</sup> Of course, the categories of “idea” and “expression” are themselves slippery, for just about every element of a creative work could be characterized as either.

<sup>221</sup> 724 F.2d 357 (2d Cir. 1983).

<sup>222</sup> *Id.* at 360. The specific “expression” of the exaggerated musculature in Mattel’s dolls did constitute copyrightable material, but this was not substantially similar to the musculature of Azrak-Hamway’s dolls. *Id.* at 360.

<sup>223</sup> 703 F. Supp. 1054 (S.D.N.Y. 1989).

arose only from nonprotectable ideas, noting that “plaintiff’s work is not a version of a standard human form or a standard doll form but an abstract work which is entirely original.”<sup>224</sup> Because the doll was not “standard,” it was an expression eligible for copyright protection. Similarly, in *Knickerbocker Toy Co. v. Genie Toys, Inc.*, the court rejected the defendant’s argument that a dog in a train engineer’s uniform represented an unprotectable idea.<sup>225</sup> The court noted that “[w]hile such a phenomenon might exist, it is *hardly so common* as to require the conclusion that this combination is common or somehow in the public domain.”<sup>226</sup>

Likewise, in *Hedaya Bros., Inc. v. Capital Plastics, Inc.*, the district court denied an infringement action involving two fabric designs depicting various types of fruit in mason jars with a gingham check background.<sup>227</sup> In rejecting the plaintiff’s claims, the court noted that “[p]lainly, the ideas contained in the Country Gingham Ensemble were old hat, and the originality of plaintiff’s design was minimal.”<sup>228</sup> While the court describes the *ideas* as “old hat,” the court’s reasoning suggests that it considered the use of mason jars with a gingham check background to be an idea simply *because* it was old hat.<sup>229</sup>

Courts’ equation of commonplace elements with ideas becomes more comprehensible when understood in the context of copyright’s utilitarian aims. Precisely because some expression, such as a crouching stance or fruit mason jars on a gingham check background, has become so widely-used and imbued with social meaning, it

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<sup>224</sup> *Id.* at 1060. Here the court is using “original” not in the copyright sense of connoting independent creation, but in the patent sense of meaning “novel.”

<sup>225</sup> 491 F. Supp. 526 (E.D. Mo. 1980).

<sup>226</sup> *Id.* at 529 (emphasis added).

<sup>227</sup> 493 F. Supp. 1021 (S.D.N.Y. 1987).

<sup>228</sup> 493 F. Supp. at 1024.

<sup>229</sup> *See* Amy B. Cohen, *supra* note 207, at 218-19.

becomes a basic building block freely open to the creative public. Adopting the awkward phrasing of the idea-expression dichotomy, society's continual use of an expression can transform that expression into an idea.

The second, more direct mechanism by which copyright accommodates the evolution of intellectual infrastructure is the scenes a faire doctrine. This doctrine recognizes that certain "stock" scenes, characters, and plot devices necessary to express a type of story are not subject to copyright.<sup>230</sup> In other words, an expression repeated so often that it becomes a standard necessary for communicating a communally-recognizable story is freely appropriable to all authors. As with the unfortunately named idea-expression dichotomy, the scenes a faire doctrine recognizes a continuum that requires greater particularization and unique detail in otherwise "stock" elements before those elements will receive copyright protection. In applying a higher bar for copyrightability for stock or standard elements, the scenes a faire doctrine recognizes these stock expressions as "raw" and thus generally available in the public domain.

For example, in *Walker v. Time Life Films, Inc.*, the Second Circuit compared a book and an allegedly infringing movie depicting a struggling police precinct in the Bronx.<sup>231</sup> The court noted that "drunks, prostitutes, vermin and derelict cars would appear in any realistic work about the work of policemen in the South Bronx," and thus constituted non-protectable scenes a faire.<sup>232</sup> Furthermore, "[f]oot chases and the morale problems of policemen, not to mention the familiar figure of the Irish cop, are venerable and often-recurring themes of police fiction," and are only copyrightable upon receiving

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<sup>230</sup> See generally, Kurtz, *The Scenes a Faire Doctrine*, *supra* note 39.

<sup>231</sup> 784 F.2d 44 (2d Cir. 1986).

<sup>232</sup> 784 F.2d at 50.

unique expression.<sup>233</sup> While the police fiction genre is of relatively recent vintage, these expressions are already so standard that, absent some differentiating detail, they are not copyrightable.<sup>234</sup>

In *Atari, Inc. v. North American Philips Consumer Elecs. Corp.*, the Seventh Circuit compared Atari's popular "Pac-Man" game with North American's allegedly infringing "K.C. Munchkin."<sup>235</sup> The court noted that "[c]ertain *expressive matter*" in Pac-Man "should be treated as scenes a faire and receive protection only from virtually identical copying."<sup>236</sup> Because expressions such as a graphical maze and scoring table are standard elements that society uses in many ways, these *expressions* are nonprotectable.<sup>237</sup>

Although not dealing with scenes a faire per se, *Lotus Dev. Corp. v. Borland Int'l* also reflects courts' reluctance to recognize copyrights over elements perceived as standard.<sup>238</sup> In Lotus's infringement case against Borland, the court held that Lotus 1-2-3's menu command hierarchy was an uncopyrightable method of operation.<sup>239</sup> While the court rested its holding on this statutory exclusion from copyrightable subject matter, considerations of widespread consumer usage loomed large. The court rejected as "absurd" the possibility that users familiar with Lotus 1-2-3 would have to learn different methods for performing identical functions in programs from other manufacturers.<sup>240</sup> In

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<sup>233</sup> *Id.*

<sup>234</sup> See also *Eichel v. Marcin*, 241 F. 404, 409-10 (D.C.N.Y. 1913) (finding no copyright in elements of a play that were "old" and "well exploited" in numerous other literary works).

<sup>235</sup> 672 F.2d 607 (7th Cir. 1982).

<sup>236</sup> *Id.* at 617 (emphasis added).

<sup>237</sup> See *Berkic v. Crichton*, 761 F.2d 1289 (9th Cir. 1985) ("The common use of such stock . . . merely reminds us that in Hollywood, as in the life of men generally, there is only rarely anything new under the sun.").

<sup>238</sup> 49 F.3d 807 (1st Cir. 1995).

<sup>239</sup> *Id.* at 817; see 17 U.S.C. § 102(b).

<sup>240</sup> 49 F.3d at 817-18.

his concurring opinion, Judge Boudin observed, “A new menu may be a creative work, but over time its importance may come to reside more in the investment that has been made by *users* in learning the menu and in building their own mini-programs—macros—in reliance upon the menu.”<sup>241</sup> While Lotus’s menu has some intrinsic merit, much of its value comes from its widespread adoption as a standard, and copyright should not enable a monopoly on that standard.<sup>242</sup>

In sum, courts apply the idea-expression dichotomy not based on a priori definitions of these categories, but from policy judgments for best balancing exclusive rights with a robust public domain. While this consequence-driven determination is subject to criticism as arbitrary and subjective,<sup>243</sup> my aim here is not to defend the idea-expression dichotomy against these critiques, but to highlight one of its lesser-appreciated features. The idea-expression dichotomy and the scenes a faire doctrine, however analytically flawed, allow copyright to dynamically adjust what it labels as intellectual infrastructure as social practice and reliance interests evolve. These doctrines recognize that certain “cooked” elements that might otherwise constitute protectable expressions can, through widespread social adoption and reliance, attain an infrastructural status that moves them out of the realm of exclusive rights and into the realm of non-protectable ideas. Like genericity, the idea-expression dichotomy dynamically accounts for changes in culture and intellectual infrastructure.<sup>244</sup> Patent law lacks this sensitivity to social context and social evolution, a characteristic we will now examine.

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<sup>241</sup> *Id.* at 819-20 (Boudin, J., concurring).

<sup>242</sup> Some have even argued for copyright to adopt a genericity doctrine for arbitrary expressions that become generic. See Lee B. Burgunder & Casey E. Heckman, *An Emerging Theory of Computer Software Genericism*, 2 HIGH TECH. L.J. 229, 247 (1987).

<sup>243</sup> See *supra* notes 208-214 and accompanying text.

<sup>244</sup> See Sunder, *supra* note 1, at 268; Cohen, *supra* note 22, at 1177 (describing creativity as “an emergent property of social and cultural systems, continually shaped by and shaping other social changes”).

### **C. Patents: Narrowness and Rigidity in Defining Intellectual Infrastructure**

Compared with trademark and copyright, patent law takes the narrowest and most rigid approach to defining intellectual infrastructure. Excluding natural laws, physical phenomena, and abstract ideas from patentability serves the functional purpose of keeping basic building blocks of productivity in the public domain. However, these “raw” assets are not the only basic building blocks of invention. Patented technologies, which are “cooked,” can also attain infrastructural status through widespread use and reliance. However, patent law’s approach to intellectual infrastructure has no mechanism for accommodating this dynamic by liberalizing access to foundational cooked assets.

As with the idea-expression dichotomy, the prohibition against patenting natural laws, physical phenomena, and abstract ideas initially appears to involve objectively definable categories. However, as Justice Frankfurter remarked in his concurring opinion in *Funk Bros. Seed Co. v. Kalo Inoculant Co.*:

It only confuses the issue . . . to introduce such terms as “the work of nature” and the “laws of nature.” For these are vague and malleable terms infected with too much ambiguity and equivocation. Everything that happens may be deemed “the work of nature,” and any patentable composite exemplifies in its properties “the laws of nature.” Arguments drawn from such terms for ascertaining patentability could fairly be employed to challenge almost every patent.<sup>245</sup>

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<sup>245</sup> 333 U.S. 127, 134-35 (1948).

For both copyright and patent, the difference between ideas and natural elements, on the one hand, and particularized expressions and inventions, on the other, is one of degree rather than kind.<sup>246</sup>

Something else seems to be going on here. As with the idea-expression dichotomy, courts have historically employed functional considerations related to advancing progress when drawing the line between non-patentable manifestations of nature and patentable inventions. In some cases, this preoccupation with progress led courts to preserve as intellectual infrastructure creations that were not immediately useful, but perhaps could be subsequently refined into useful applications. Thus in *Gottschalk v. Benson*, the lack of practical utility of a process for converting binary coded decimals to pure binary numbers contributed to the Supreme Court's conclusion that the process impermissibly claimed an abstract idea.<sup>247</sup> Conversely, in *Parke-Davis & Co. v. H.K. Mulford & Co.*, mere differences in degree justified upholding a patent on purified human adrenaline because purification rendered the extract "for every practical purpose a new thing commercially and therapeutically."<sup>248</sup> As we have seen, this preoccupation with progress has also led courts to characterize an invention as intellectual infrastructure so that its patenting would not unduly burden downstream exploitation.<sup>249</sup> This was the case in *Funk. Bros.*, which sought to preserve natural elements as a "storehouse of

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<sup>246</sup> Compare *Funk Bros.*, 333 U.S. 127 (denying a patent on an inoculum combining various bacteria), with *Diamond v. Chakrabarty*, 447 U.S. 303 (1980) (upholding a patent on a bacterium combining various plasmids).

<sup>247</sup> *Gottschalk v. Benson*, 409 U.S. 63, 71 (1972) ("The mathematical formula involved here has no substantial practical application except in connection with a digital computer, which means that . . . the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself.").

<sup>248</sup> 189 F. 95, 103 (S.D.N.Y. 1911), *aff'd in part and rev'd in part*, 196 F. 496 (2d Cir. 1912).

<sup>249</sup> See *supra* notes 132-134 and accompanying text.

knowledge.”<sup>250</sup> Without objective definitions of what constituted, say, a natural phenomenon, courts often drew what they perceived to be an appropriate line between non-protectable and protectable assets in order to best promote technological progress.

This landscape changed dramatically in 1980 with *Diamond v. Chakrabarty*.<sup>251</sup> In upholding a patent on a genetically engineered living organism, the Supreme Court articulated a remarkably expansive definition of patentable subject matter.<sup>252</sup> Quoting the legislative history of the 1952 Patent Act, the Court noted that “Congress intended statutory subject matter to include ‘include anything under the sun that is made by man.’”<sup>253</sup> This broad formulation of patentable subject matter has proven very influential.<sup>254</sup> By subtraction, it narrowly defines *nonpatentable* intellectual infrastructure, which the *Chakrabarty* court identified as “laws of nature, physical phenomena, and abstract ideas.”<sup>255</sup>

A year after *Chakrabarty*, the Supreme Court offered another significant gloss on patentable subject matter in *Diamond v. Diehr*.<sup>256</sup> In upholding the patentability of an algorithm-based process for curing rubber, the Court emphasized that determinations of patentable subject matter are “wholly apart” from inquires into substantive attributes of

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<sup>250</sup> 333 U.S. at 130.

<sup>251</sup> 447 U.S. 303, 318 (1980). Other developments, such as the Bayh-Dole Act of 1980 and the creation of the Court of Appeals for the Federal Circuit in 1982, also reflect the generally pro-patent character of this era. See Rai, *supra* note 170, at 94-95.

<sup>252</sup> A. Samuel Oddi, *Regeneration in American Patent Law: Statutory Subject Matter*, 46 IDEA 491, 546 (2006) (“[I]t marked a metamorphosis in how the Supreme Court approached patent issues—backing away from judicial restraint . . . to adopting an expansive view of the instrumental goal of the patent system in evolving technologies.”).

<sup>253</sup> 447 U.S. at 309 (quoting S. Rep. No. 1979, 82d Cong., 2s Sess., 5 (1952); H.R. Rep. No. 1923, 82d Cong., 2d Sess., 6 (1952)).

<sup>254</sup> See Robert Greene Sterne & Lawrence B. Bugaisky, *The Expansion of Statutory Subject Matter under the 1952 Patent Act*, 37 AKRON L. REV. 217, 218-19 (2004) (“After *Chakrabarty*, reference to statutory subject matter and ‘anything under the sun’ appeared frequently in decisions.”).

<sup>255</sup> 447 U.S. at 309.

<sup>256</sup> 450 U.S. 175 (1980).

an invention, such as its novelty.<sup>257</sup> This decision encouraged a formalistic examination of whether a claimed invention constituted patentable subject matter, divorced from a holistic evaluation of the invention's merits or its potential impact on downstream productivity.<sup>258</sup> In the wake of these rulings, the Federal Circuit's recent decision in *State Street Bank & Trust Co. v. Signature Financial Group, Inc.* produced a test that essentially equates patentable subject matter with utility.<sup>259</sup> While considerable tension exists between *State Street* and *Diehr*, *State Street* nevertheless continues a trend reflected in *Chakrabarty* of a one-way ratchet towards expansively construing patentable subject matter and narrowly construing nonpatentable intellectual infrastructure.

These decisions establish a narrow, formalistic approach to defining intellectual infrastructure. Courts may not consider the macroscopic implications of patenting an item when determining where it falls along the continuum from unpatentable intellectual infrastructure to patentable application. While this arguably enhances the analytical rigor of the categories comprising intellectual infrastructure (i.e., natural laws, physical phenomena, and abstract ideas), it eliminates some valuable flexibility. Patent law lacks a mechanism for courts to apply intellectual infrastructure doctrine in a functional way that fully achieves its intended objectives of allowing liberal access to basic building blocks of invention.

Natural laws, physical phenomena, and abstract ideas are not patentable based on a policy determination that the inventive community needs open access to this intellectual

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<sup>257</sup> *Id.* at 191 (quoting *In re Bergy*, 596 F.2d 952, 961 (Cust. & Pat. App., 1979)).

<sup>258</sup> A foil to Justice Rehnquist's formalistic holding is Justice Stevens' dissent, which explicitly considered the burgeoning software industry and the role of patents in its development: "Notwithstanding fervent argument that patent protection is essential for the growth of the software industry, commentators have noted that 'this industry is growing by leaps and bounds without it.'" 450 U.S. 175, 217 (Stevens, J., concurring) (quoting Michael G. Gemignani, *Legal Protection for Computer Software: The View From '79*, 7 RUTGERS J. COMPUTERS, TECH. & L. 269, 270 (1980)).

<sup>259</sup> 149 F.3d 1368, 1375 (Fed Cir. 1998).

infrastructure in order to be productive. However, “raw” ingredients are not the only kinds of nonrival assets that exhibit great value as inputs into a diverse array of downstream applications. Notably, certain *patented technologies themselves*, such as gene splicing, extracted human embryonic stem cells, and interoperability standards in information technology, can also attain infrastructural status. The same prudential reasons that counsel for liberalizing access to natural laws, physical phenomena, and abstract ideas apply as well to these patented technologies that are objects of widespread adoption and reliance in innovation markets.<sup>260</sup> However, patent law presently does not accommodate the inventive community’s need to access patented technologies that are so cooked, they comprise intellectual infrastructure.

Mechanisms to carve out exceptions permitting unlicensed use of patented infrastructure have proven inadequate. One potential avenue for enhancing access to patented infrastructure is the common law experimental use exception.<sup>261</sup> This doctrine traditionally exempted academic, philosophical, and noncommercial uses of patented inventions from infringement.<sup>262</sup> In theory, universities and noncommercial researchers could invoke this exception to avoid liability for using patented inventions in an infrastructural manner as inputs to basic scientific research.<sup>263</sup> In particular, this doctrine was potentially helpful in allowing access to patented research tools—technological *inputs* to basic scientific research such as extracted human embryonic stem cells and gene

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<sup>260</sup> See Lee, *Inverting the Logic of Scientific Discovery*, *supra* note 4, at 108-09.

<sup>261</sup> See *Whittemore v. Cutter*, 29 F. Cas. 1120 (C.C.D. Mass. 1813) (No. 17,600).

<sup>262</sup> See *Sawin v. Guild*, 21 F. Cas. 554, 555 (C.C.D. Mass. 1813) (No. 2,391); *Poppenhusen v. Falke*, 19 F. Cas. 1048, 1049 (C.C.S.D.N.Y. 1861) (No. 11,279); 1-3 WILLIAM C. ROBINSON, *THE LAW OF PATENTS FOR USEFUL INVENTIONS* (1890).

<sup>263</sup> See Elizabeth A. Rowe, *The Experimental Use Exception to Patent Infringement: Do Universities Deserve Special Treatment?*, 57 HASTINGS L.J. 921 (2006).

fragments.<sup>264</sup> However, the Federal Circuit has severely narrowed the experimental use exception, thus eliminating this “safety valve” that may have otherwise enabled unlicensed use of patented infrastructure.<sup>265</sup> An existing *statutory* experimental use exception, which allows unlicensed use of patented materials only for tests related to submitting a new drug application to the Food and Drug Administration, is clearly too narrow to facilitate access to a broad array of patented infrastructure.<sup>266</sup>

Commentators have also focused on the so-called reverse doctrine of equivalents as a mechanism for unlicensed users of patented technology to avoid infringement.<sup>267</sup> This doctrine exempts from infringement inventions that literally fall within the claims of a prior patented invention but that are significantly different in principle and function from the original.<sup>268</sup> However, this doctrine avoids liability for radical *improvements* of patented inventions and is thus inapposite to the most likely uses of patented intellectual infrastructure. Most users of infrastructure do not intend to improve upon it in any radical way; as infrastructure, these elements have demonstrated value when used as intended. As such, the reverse doctrine of equivalents is not likely to shield infrastructural uses of patented inventions from infringement liability.

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<sup>264</sup> The National Institutes of Health defines research tools as “tools that scientists use in the laboratory, including cell lines, monoclonal antibodies, reagents, animal models, growth factors, combinatorial chemistry and DNA libraries, clones and cloning tools (such as PCR), methods, laboratory equipment and machines.” Principles and Guidelines for Recipients of NIH Research Grants and Contracts on Obtaining and Disseminating Biomedical Research Resources: Final Notice, 64 Fed. Reg. 72,090, 72,092 n.1 (Dec. 23, 1999).

<sup>265</sup> See *Madey v. Duke University*, 307 F.3d 1351 (Fed. Cir. 2002); Katherine J. Strandburg, *What Does the Public Get? Experimental Use and the Patent Bargain*, 2004 WIS. L. REV. 81, 84.

<sup>266</sup> 35 U.S.C. § 271(e)(1); See *Merck KGaA v. Integra Lifesciences I*, 545 U.S. 193, 205 n.7 (2005) (declining to categorically exempt research tools used in new drug testing under the statutory experimental use exception).

<sup>267</sup> See *Boyden Power-Brake Co. v. Westinghouse*, 170 U.S. 537 (1898); see, e.g., Lemley, *Economics of Improvement*, *supra* note 15, at 1010-13; Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 862-68 (1990).

<sup>268</sup> See Lemley, *Economics of Improvement*, *supra* note 15, at 1010-11.

As a result, the current patent framework is preoccupied with first-order progress. An invention that is not a natural law, physical phenomena, or abstract idea, and that fulfills the other criteria for patentability, will receive a patent. This is an easy scheme in which patents promote progress. However, this framework does not adequately consider second-order progress dynamics in which patented technologies themselves are indispensable inputs to downstream productivity. Like a trademarked word that has become generic or a standard expression that has become non-protectable, certain inventions can become so widely-adopted and relied upon that they become basic infrastructure, thus warranting liberalized access. Lack of access to these paradigmatic technologies can inhibit “normal” research and development, and may dampen the activities that lead to revolutionary technological progress.<sup>269</sup>

#### **D. The Singularity of Patent Law, Potential Explanations, and Implications**

An interesting continuum emerges wherein trademark is highly responsive to evolving social practice, copyright implicitly considers the “moving target” of what is considered stock and standard in applying the idea-expression dichotomy, and patent law takes the narrowest and most rigid approach to defining intellectual infrastructure. While there has been some macro-level evolution in patentable subject matter doctrine, it has proceeded in the unhelpful direction toward narrowly construing intellectual infrastructure and providing less flexibility for courts to apply this doctrine functionally

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<sup>269</sup> See THOMAS S. KUHN, *THE STRUCTURE OF SCIENTIFIC REVOLUTIONS* (3d ed. 1996); Peter Lee, Note, *Patents, Paradigm Shifts, and Progress in Biomedical Science*, 114 *YALE L.J.* 659 (2004) (arguing that time-limited access to paradigmatic technologies may be the most effective mechanism for sparking paradigm shifts) [hereinafter Lee, *Paradigm Shifts*].

on a case-by-case basis. Of course, the mere existence of differences is not necessarily cause for concern. After all, trademark, copyright, and patent do vary in their ends and means. This section explores some of the reasons for patent law's singularity, and concludes that they are insufficient to warrant such a rigid approach to defining intellectual infrastructure. It also explores the empirical need for a more flexible definition of intellectual infrastructure based on the rapid dynamics of patent-oriented industries.

The first and most obvious distinguishing factor of patent law is its relatively short term of protection. Trademarks last indefinitely, as long as the mark continues to signify an individual product or firm.<sup>270</sup> Given the potentially infinite term of a trademark, genericide provides a valuable mechanism for revisiting and cancelling a mark that no longer identifies a particular source. As we have seen, linguistic culture evolves rather rapidly, with marks such as aspirin, thermos, and "You Have Mail" becoming generic within a generation. Copyrights also last a relatively long time, generally the author's life plus seventy years.<sup>271</sup> The idea-expression dichotomy operates differently from genericide in that a novel expression rarely "becomes" an unprotectable idea within the life of the copyright.<sup>272</sup> However, over the course of several generations, once-novel elements can become stock or standard, and thus freely available in the public

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<sup>270</sup> See Lanham Act § 9, 15 U.S.C. § 1059 (2000) (allowing successive 10-year periods of registration). Coca-Cola first registered its trademark in 1893. U.S. Reg. No. 22,406 (Jan. 31, 1893).

<sup>271</sup> See Sonny Bono Copyright Term Extension Act of 1998, Pub. L. No. 105-298, 112 Stat. 2827 (current version at 17 U.S.C. §§ 301-304 (2006)) (extending copyright protection an additional 20 years to the author's life plus seventy years); see also *Eldred v. Ashcroft*, 537 U.S. 186, 199-200 (2003) (upholding the constitutionality of term extension).

<sup>272</sup> Such rare examples are most likely to arise in computer science cases. Cf. *Apple Computer v. Microsoft Corp.*, 35 F.3d 1435, 1444 (9th Cir. 1994) (noting that overlapping windows have become the clear preference in graphical interfaces).

domain. The same concerns about locking up basic infrastructure for extended periods of time inform the idea-expression dichotomy as well as genericide.

In contrast, a patent term lasts only twenty years from the date of filing.<sup>273</sup> Clearly, the relatively short term of a patent mitigates concerns over the inaccessibility of patented intellectual infrastructure. All patented inventions fall into the public domain after twenty years, and this “temporal spillover” of positive externalities reflects the conscious design of the patent system.<sup>274</sup> However, while the relative brevity of the patent term mitigates concerns over locking up infrastructure, it does not extinguish them. At a theoretical level, it is certainly plausible that patented inventions may attain infrastructural status well before the patent expires, especially in fast-moving industries such as biotechnology and information technology. Absent efficient licensing, discussed below, patents on this infrastructure may inhibit myriad downstream applications. Here, my normative argument for patent law to better accommodate the evolution of intellectual infrastructure intersects with empirical evidence demonstrating the need for such accommodation. Therefore, I offer three examples of inventions that have attained infrastructural status only a few years after patenting: gene splicing, human embryonic stem cells, and information technology standards.

In 1980, Stanley Cohen and Herbert Boyer patented the technique for gene splicing, the process by which researchers isolate, manipulate, and reintroduce DNA into cells.<sup>275</sup> The process is the bedrock of recombinant DNA technology and facilitates a

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<sup>273</sup> 35 U.S.C. § 154(a)(2).

<sup>274</sup> See Frischmann & Lemley, *supra* note 10, at 291.

<sup>275</sup> See U.S. Patent No. 4,740,470 (1988); U.S. Patent No. 4,468,464 (1984); U.S. Patent No. 4,237,224 (1980).

wide array of downstream applications.<sup>276</sup> Patent assignee Stanford University experimented with several licensing arrangements, but generally licensed the technology at a low fee of \$10,000.<sup>277</sup> The broad utility of the invention coupled with this low license fee led to widespread adoption in the biotechnology sector, and as early as seven years after the patent was issued, recombinant DNA product sales reached \$500 million.<sup>278</sup> Eleven years after the patent issued, firms were introducing 400 new products annually based on recombinant gene technology.<sup>279</sup> In all, 468 companies licensed the gene splicing patent, which generated \$254 million in licensing revenue over its seventeen-year term.<sup>280</sup> Broad, low-cost licensing by Stanford allowed myriad development efforts to coalesce around this infrastructure, thus generating a multitude of applications. Conversely, raising licensing fees or otherwise restricting access to this technology would, in all likelihood, have had a significantly negative impact on downstream development.<sup>281</sup>

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<sup>276</sup> Sally Smith Hughes, *Making Dollars out of DNA: The First Major Patent in Biotechnology and the Commercialization of Molecular Biology, 1974-1980*, 92 *ISIS* 541, 542 (2001).

<sup>277</sup> See Oren Bar-Gill & Gideon Parchomovsky, *The Value of Giving Away Secrets*, 89 *VA. L. REV.* 1857, 1871 (2003). The Cohen-Boyer patent has generated licensing revenues of upwards of \$155 million. *Id.*; Maryann Feldman et al., *Commercializing Cohen-Boyer 1980-1997*, DRUID Working Paper No. 05-21, at 20 (2005).

<sup>278</sup> Feldman, *supra* note 277, at 25.

<sup>279</sup> *Id.* at 25.

<sup>280</sup> *Id.* at 20, 23. Presently, the patent term is twenty years. 35 U.S.C. § 154(a).

<sup>281</sup> Polymerase chain reaction (PCR) offers an illuminating comparison. PCR is a process for generating many copies of DNA strands, and has become “an indispensable research tool employed in nearly every biological field.” Fore, Jr. et al., *The Effects of Business Practices, Licensing, and Intellectual Property on Development and Dissemination of the Polymerase Chain Reaction: Case Study*, 1 *J. BIOMEDICAL DISCOVERY AND COLLABORATION* 7, \*2 (July 3, 2006). Cetus, a private biotech company, developed and patented PCR in 1987. Studies suggest that both reasonably priced licenses and rampant infringement contributed to its broad adoption. *Id.* at \*14-15. While PCR ultimately enjoyed widespread use, a patentee’s “rational forbearance” from bringing infringement suits does not necessarily provide reliable access to intellectual infrastructure. See *Cetus To Exact Royalties from PCR Sales; Probe Absolves Convicted Rapist*, *BIOTECH. NEWSWATCH*, Sept. 5, 1988, at 7.

Human embryonic stem cells are another technology that achieved infrastructural status only a few years after patenting.<sup>282</sup> James Thomson, a researcher at the University of Wisconsin at Madison, first isolated human embryonic stem cells in 1998, and ultimately received two key patents on this “technology.”<sup>283</sup> In a sense, stem cells are the quintessential infrastructural resource, for they retain the ability to differentiate into a wide array of particularized cells.<sup>284</sup> Despite only being about half-way through the term of the original patent, the scientific community has already reached consensus that these assets represent the key to a broad range of basic experimentation and downstream therapies.<sup>285</sup> Notwithstanding voluntary arrangements to license these cells to noncommercial, federally-funded researchers on a royalty-free basis,<sup>286</sup> access to these cells has not met demand.<sup>287</sup> While these patents currently face challenges on nonobvious grounds,<sup>288</sup> several years of exclusive rights have already prevented some downstream research and development from occurring. Successful defense of these challenges may prolong this inhibition.

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<sup>282</sup> See Lee, *Inverting the Logic of Scientific Discovery*, *supra* note 4; Lee, *Paradigm Shifts*, *supra* note 269.

<sup>283</sup> U.S. Patent No. 5,843,780 (filed Jan. 18, 1996); U.S. Patent No. 6,200,806 (filed June 26, 1998).

<sup>284</sup> See NIH, STEM CELL INFORMATION 1 (2002),

<http://stemcells.nih.gov/staticresources/info/basics/StemCellBasics.pdf>.

<sup>285</sup> Christopher D. Hazuka, *Supporting the Work of Lesser Geniuses: An Argument for Removing Obstructions to Human Embryonic Stem Cell Research*, 57 U. MIAMI L. REV. 157, 164-65 (2002); NIH, *supra* note 284.

<sup>286</sup> WARF signed a Memorandum of Understanding with the NIH allowing the NIH to retain rights to the '780 patent because federal grants funded the underlying research. See Josephine Johnston & Angela A. Wasunna, *Patents, Biomedical Research, and Treatments*, Jan-Feb. 2007 HASTINGS CENTER REPORT, s12; Jeanne F. Loring & Cathryn Campbell, *Intellectual Property and Human Embryonic Stem Cell Research*, 311 SCIENCE 1716, 1717 (March 24, 2006).

<sup>287</sup> See, e.g., Emily Singer, *Stem Cells Stuck in Patent Quagmire*, TECH. REV. (Apr. 24, 2006); Loring & Campbell, *supra* note 286, at 1716.

<sup>288</sup> Andrew Pollack, *3 Patents on Stem Cells Are Revoked in Initial Review*, N.Y. Times, Apr. 3, 2007; Emily Singer, *Stem Cells Stuck in Patent Quagmire, Will Two Broad Patents Hinder Embryonic Stem Cell Research?*, TECHNOLOGY REVIEW, available at <http://www.technologyreview.com/Biztech/16728/>.

Standards in information technology are a third kind of invention that can achieve infrastructural status well before the patent term expires.<sup>289</sup> Standards take a variety of forms, but I focus here on “common platform” standards that facilitate interoperability in information technology networks.<sup>290</sup> Patents on strong network standards can create durable market power in these fields.<sup>291</sup> While many standard-setting organizations (“SSOs”) discourage proprietary standards, favoring non-proprietary, “open” standards, patented inventions do find their way into widely-adopted standards.<sup>292</sup> In 1994, several SSOs created the JPEG standard for compressing photographic images. Within three years, the standard became a fundamental mass-marketed technology.<sup>293</sup> In 2002, video networking company Forgent Networks asserted patent rights over the technology underlying JPEG. Forgent collected over \$100 million in royalties before a consortium of information technology companies successfully challenged the validity of the patent.<sup>294</sup> JPEG thus sounds a cautionary tale about patenting infrastructure in the information technology sector.<sup>295</sup> Although not relevant to JPEG, the problem of patented standards is accentuated where a single standard is based on multiple patents, thus increasing negotiating and other licensing costs.<sup>296</sup> The infrastructural nature of standards, which generate immense value from widespread use in a particular

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<sup>289</sup> See Janice M. Mueller, *Patent Misuse through the Capture of Industry Standards*, 17 BERKELEY TECH. L. J. 623 (2002); Mark A. Lemley, *Intellectual Property Rights and Standard-Setting Organizations*, 90 CAL. L. REV. 1889 (2002) [hereinafter Lemley, *Standard-Setting Organizations*].

<sup>290</sup> See O’Rourke, *supra* note 15, at 1179 (“[I]n the market for operating systems software, which exhibits powerful network effects, strong patent protection can create an insurmountable barrier to entry while also allowing a single patentee to direct innovation in the market for applications running on the dominant system.”).

<sup>291</sup> Cohen & Lemley, *supra* note 120, at 22.

<sup>292</sup> See Lemley, *Standard-Setting Organizations*, *supra* note 292, at 1893.

<sup>293</sup> Priscilla Caplan, *Patents and Open Standards*, 14 INFORMATION STANDARDS QUARTERLY 1, 2 (2003).

<sup>294</sup> See Michael Kannellos, *Forgent Settles JPEG Patent Cases*, CNET NEWS.COM (Nov. 1, 2006).

<sup>295</sup> See Greg R. Vetter, *Open Source Licensing and Scattering Opportunism in Software Standards*, 48 B.C. L. REV. 225, 230 (2007).

<sup>296</sup> Mark Lemley, *Ten Things to do about Patent Holdup of Standards (And One Not To)*, 48 B.C. L. REV. 149, 152 (2007) [hereinafter Lemley, *Patent Holdup of Standards*].

community, has motivated calls to limit exclusive rights over standards through copyright and patent.<sup>297</sup>

These snapshots reveal that patented technologies do attain infrastructural status before the patent term expires. However, they raise another potential objection to the argument here for liberalizing access to patented intellectual infrastructure: licensing. Standard economic theory generally predicts that patentees will license efficiently to allow all potentially valuable uses of an invention to occur.<sup>298</sup> However, for a variety of reasons, efficient licensing (from a society-wide perspective) will not always arise. First, the value of intellectual infrastructure is extremely difficult to measure and capture.<sup>299</sup> Because the social value of an infrastructural asset such as human embryonic stem cells is difficult to measure, and because capturing the value of its downstream externalities is virtually impossible, determining an appropriate license fee is quite challenging.<sup>300</sup> Second, the patentee of an infrastructural invention may behave strategically to inflate licensing fees.<sup>301</sup> The market power conferred by patenting an indispensable infrastructural invention allows patentees to charge monopolistic prices, depressing access to the asset at large. An extreme example of this is Rambus's apparent attempt to corner the memory chip market by patenting key memory chips upon learning that they would become the industry standard.<sup>302</sup>

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<sup>297</sup> See, e.g., Pamela Samuelson, *Questioning Copyrights in Standards*, 48 B.C. L. Rev. 193 (2007); Lemley, *Patent Holdup of Standards*, *supra* note 297.

<sup>298</sup> See O'Rourke, *supra* note 15, at 1179.

<sup>299</sup> Frischmann, *Economic Theory*, *supra* note 7, at 958.

<sup>300</sup> See Frischmann & Lemley, *supra* note 10, at 257.

<sup>301</sup> Cf. Lemley, *Economics of Improvement*, *supra* note 15, at 1058-59. While Lemley discusses strategic behavior involving an original inventor and a subsequent improver, similar behavior may apply to licenses for users of patented infrastructure who do not intend to improve on the infrastructure.

<sup>302</sup> See *In the Matter of Rambus, Inc.*, (FTC docket 9302); Pamela A. MacLean, '*Rambus' Ruling is a Standards Landmark*', THE NATIONAL LAW JOURNAL (Oct. 24, 2006); Mark A. Lemley & Philip J. Weiser, *Should Property Rules or Liability Rules Govern Information?*, 85 TEX. L. REV. 783, 837-38 (2007).

Third, as Mark Lemley has thoroughly described, licensing transactions are costly.<sup>303</sup> While this is true for any patented technology, aggregate transaction costs will be much higher for infrastructural inventions needed by many parties.<sup>304</sup> Finally, even if the patentee is willing to license it at competitive prices, this may only be only one of several inventions that a subsequent exploiter needs.<sup>305</sup> As Michael Heller and Rebecca Eisenberg have chronicled, the need to bundle licenses from many different patentees may render some downstream lines of development prohibitively expensive.<sup>306</sup> This gives rise to a tragedy of the anticommons wherein the requirement to clear many patent rights leads to inefficient underuse of protected resources.<sup>307</sup> In sum, voluntarily licensing may not provide adequate access to patented intellectual infrastructure.

Another potential reason for patent law's singularity arises from the unique interface of trademark and copyright with the First Amendment.<sup>308</sup> Trademarks, both words and symbols, have become linguistic mechanisms of expression, particularly in popular culture.<sup>309</sup> Furthermore, it is well-recognized that the idea-expression dichotomy plays a crucial role in balancing the conflicting interests of the copyright and the First

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<sup>303</sup> Lemley, *Economics of Improvement*, *supra* note 15, at 1053. Lemley, writing in 1997, cites studies estimating that transaction costs regularly consume twenty percent of the total value of a technology license. *Id.* at 1053-54.

<sup>304</sup> In the real property realm, inherently public property acquires that status partly because efficient licensing to thousands of potential licensees would be impracticable. Similarly, the transaction costs for licensing ideas, natural laws, and physical phenomena to all potential users would be prohibitively expensive. For these types of assets, prospect theory, which emphasizes the efficiency of allowing one party to orchestrate the development of a given prospect, is largely inapplicable. *See* Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265 (1977).

<sup>305</sup> *See* Lemley, *Patent Holdup of Standards*, *supra* note 296, at 152 (describing the problem of royalty-stacking in the information technology sector).

<sup>306</sup> Heller & Eisenberg, *supra* note 3.

<sup>307</sup> *Cf.* Michael Heller, *The Tragedy of the Anticommons*, 111 HARV. L. REV. 621 (1998).

<sup>308</sup> *See, e.g.,* Keith Aoki, *Authors, Inventors and Trademark Owners: Private Intellectual Property and the Public Domain Part I*, 18 COLUM.-VLA J.L. & ARTS 1, 11-12 (1993) [hereinafter Aoki, *Authors, Inventors and Trademark Owners I*].

<sup>309</sup> *See* Dreyfuss, *Expressive Genericity*, *supra* note 75, at 397.

Amendment.<sup>310</sup> Perhaps courts justifiably pay greater attention to the downstream implications of exclusive rights in trademark and copyright because of their potential burdens on speech, a concern that is perceived as absent from patent law.<sup>311</sup> However, this counterargument only corroborates the broader thesis that downstream implications of protection are a legitimate concern when extending intellectual property rights. The mere fact that speech concerns do not apply to patent law (which is debatable) does nothing to undermine the broader principle that intellectual property is and should be attentive to the implications of upstream exclusive rights on downstream activity.

Another potential explanation for patent law's uniquely formalistic approach to defining intellectual infrastructure relates to the substantive hurdles necessary to obtain a patent.<sup>312</sup> Unlike trademarks and copyrights, patents undergo a rigorous examination process.<sup>313</sup> Examiners at the Patent and Trademark Office ("PTO") assess whether an invention merits a patent by satisfying certain statutorily-defined criteria, including novelty, statutory bars, utility, and nonobviousness.<sup>314</sup> Furthermore, during prosecution, the PTO may compel the patent applicant to narrow her claims, which broadens the space

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<sup>310</sup> See Melville B. Nimmer, *Does Copyright Abridge the First Amendment Guaranties of Free Speech and the Press?*, 17 UCLA L. REV. 1180, 1189-93 (1970).

<sup>311</sup> Mark A. Lemley & Eugene Volokh, *Freedom of Speech and Injunctions in Intellectual Property Cases*, 48 DUKE L.J. 147, 237 (1998) ("[P]atent law is qualitatively different from copyright law because most of the acts it restricts don't involve speech at all."). For a potential counterargument that patents in science may implicate First Amendment concerns, see John A. Robertson, *A Scientist's Right to Research: A Constitutional Analysis*, 51 S. CAL. L. REV. 1203, 1252 (1978).

<sup>312</sup> See *Herbert Rosenthal Jewelry Corp. v. Kalpakian*, 446 F.2d 738, 749 (9th Cir. 1971) ("[The patent] monopoly . . . is carefully circumscribed by substantive and procedural protections."); O'Rourke, *supra* note 15, at 1184 (observing that copyright has few requirements for initial protection but greater flexibility to subsequently limit that protection, while patent reflects the reverse situation).

<sup>313</sup> Regarding copyright, the Ninth Circuit has noted that "[s]o long as it is not a plagiarized copy of another's effort, there is no requirement that the work differ substantially from prior works or that it contribute anything of value." *Herbert Rosenthal*, 446 F.2d at 740.

<sup>314</sup> See 35 U.S.C. §§ 101-103.

available to subsequent innovators in the same field.<sup>315</sup> One could argue that these substantive requirements ensure that only inventions that truly advance the state of the art receive patents, and that this is an ideal outcome.

However, this argument misses the point. It is precisely because some inventions are *too* meritorious and *too* valuable that they become indispensable intellectual infrastructure meriting wide availability.<sup>316</sup> The PTO's rigorous examination of whether an invention deserves a patent does not directly consider potentially deleterious effects on downstream progress arising from lack of access to it. And again, the issue of patent scope is more relevant for subsequent *improvers* of patented technologies rather than subsequent users who wish only to use an underlying infrastructural invention as intended. A narrow patent that covers an indispensable technology will still grant exclusive rights over infrastructure and potentially inhibit downstream productivity.

A final reason for the different approaches among trademark, copyright, and patent law to defining intellectual infrastructure is one of timing. As mentioned, obtaining a trademark or copyright requires no examination process. Thus, courts determine genericity and apply the idea-expression dichotomy at the time of alleged infringement. At that point, courts have a wealth of social data from which to draw when distinguishing intellectual infrastructure from application. For trademarks, courts draw on consumer surveys, market information, brochures, and dictionaries to ascertain whether a "cooked" mark has become a generic word.<sup>317</sup> In copyright, courts can

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<sup>315</sup> See Lemley, *Economics of Improvement*, *supra* note 15, at 1000-03; Merges & Nelson, *supra* note 267, at 843.

<sup>316</sup> While I do not articulate here a strict constructivist theory of technology contending that the *meaning* of technology is contextually-contingent, such a theory does help legitimate communal claims over patented infrastructure. See Cohen, *supra* note 22, at 1183-84.

<sup>317</sup> See *America Online v. AT&T*, 243 F.3d 812, 815 (4th Cir. 2001).

consider the relative success of the original work, commonality with other works (including the allegedly infringing work), and patterns of social adoption in determining whether specific elements of a work are stock or standard and thus non-protectable.

The situation is different for patent law. The PTO first determines patentable subject matter, which is the analogous inquiry into intellectual infrastructure, at the time of patent issuance.<sup>318</sup> At this point, there is little or no social data on the invention to consider, thus causing these determinations to be formalistic rather than functionally attentive to social use. While patentable subject matter can be litigated at the time of patent infringement, its statutory design as a threshold requirement for patent issuance discourages considerations of social context. An ideal analysis of patented intellectual infrastructure would explicitly consider social data on the invention and its adoption in determining whether it merits liberalized access.

In addition to this problem of timing, courts would naturally hesitate to invalidate patents on infrastructural inventions because doing so may undermine dynamic incentives to invent. While open access to *existing* patented infrastructure helps optimize its exploitation, eliminating patent rights would discourage future inventors from creating new infrastructure.<sup>319</sup> A recent Supreme Court case offers solutions to both the problems of timing and incentives, thus opening the door for a more nuanced and functional approach to identifying and protecting patented intellectual infrastructure.

#### **Part IV. Reforming Patent Law: *eBay* and a Remedy in Remedies**

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<sup>318</sup> See 35 U.S.C. § 101.

<sup>319</sup> Cf. *Integra Lifesciences I v. Merck KGaA*, 331 F.860, 867 (Fed. Cir. 2003) (noting that subjecting research tools to the § 271(3) research exception would compromise incentives to invent).

**A. The Proposal: Property Rules for Intellectual Applications and Liability Rules for Intellectual Infrastructure**

Armed with these insights, we can take a fresh look at *eBay v. MercExchange*.<sup>320</sup> In that case, a jury found that MercExchange’s business method patent for an electronic market was valid and infringed by eBay and Half.com, a wholly owned subsidiary of eBay.<sup>321</sup> However, the district court denied MercExchange’s motion for permanent injunctive relief.<sup>322</sup> On appeal, the Federal Circuit reversed, applying its “‘general rule that courts will issue permanent injunctions against patent infringement absent exceptional circumstances.’”<sup>323</sup> The Supreme Court reversed the Federal Circuit. Writing for the majority, Justice Thomas held that the decision to grant or deny injunctive relief rests within the discretion of the district court, consistent with traditional equitable principles.<sup>324</sup> Within this framework,

A plaintiff must demonstrate: (1) that it has suffered an irreparable injury; (2) that remedies available at law, such as monetary damages, are inadequate to compensate for that injury; (3) that, considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted; and (4) that the public interest would not be disserved by a permanent injunction.<sup>325</sup>

*eBay* is a simple holding with profound implications. Courts are no longer constrained to a syllogism wherein infringement of a valid patent leads inexorably to an injunction. The possibility of granting damages and allowing infringement to continue—in essence, protecting the patent with a liability rule—offers important flexibility to courts.<sup>326</sup> In exercising this flexibility, *eBay* directs courts to consider the macroscopic implications of

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<sup>320</sup> 126 S.Ct. 1837 (2006).

<sup>321</sup> *MercExchange v. eBay*, 275 F. Supp. 2d 695 (E.D. Va. 2003), *aff’d in part, rev’d in part*, *MercExchange v. eBay*, 401 F.3d 1323 (Fed. Cir. 2005).

<sup>322</sup> *Id.*

<sup>323</sup> 126 S.Ct. at 1839 (quoting 401 F.3d 1323 at 1339).

<sup>324</sup> *Id.* at 1841.

<sup>325</sup> *Id.* at 1839.

<sup>326</sup> *See Calabresi & Melamed, supra* note 14.

protecting a patented invention with an injunction. I argue that the *eBay* framework offers a valuable opportunity for courts to differentiate patented intellectual application from infrastructure, protecting the latter with a damages rule where appropriate to foster follow-on innovation.

The third and fourth *eBay* factors are particularly relevant for determining whether a patented invention is infrastructural and eligible for liability rule protection.<sup>327</sup> Regarding the third factor, the relative hardship of an injunction on patented infrastructure will fall heavily on the defendant, for whom the patented item is indispensable for a particular line of research or development. Downstream parties enjoined from using gene splicing, embryonic stem cells, and patented interoperability standards will be severely hampered in their productive pursuits. Furthermore, in many cases, monetary damages will be adequate to compensate patentees, thus lessening their relative hardship.

The fourth factor, the public interest, even more heavily favors protecting patented intellectual infrastructure with a liability rule. Inventive communities benefit greatly from access to infrastructure because of its wide ranging applicability and general lack of substitutes. Even more, since inventors typically capture only a small proportion of the social value of their inventions, the widespread use of infrastructure will generate immense spillovers benefiting society at large.<sup>328</sup> Furthermore, imposing a liability rule will not overly compromise the public interest in maintaining dynamic incentives to invent.<sup>329</sup> Under *eBay*, infringement is not free. Under my proposal, infringers must pay

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<sup>327</sup> 126 S.Ct. at 1839.

<sup>328</sup> Frischmann & Lemley, *supra* note 10, at 268-70.

<sup>329</sup> *See Abbott Labs. v. Andrx Pharmaceuticals, Inc.*, 452 F.3d 1331, 1348 (Fed. Cir. 2006) (noting that public policy favors enforcing patent rights).

damages to patentees, thus allowing them to recoup their investment costs and encouraging future innovation.

For courts to impose a liability rule under this proposal, two conditions must be satisfied. First, a patented invention must qualify as intellectual infrastructure, meaning it must be a nonrival input into a wide array of downstream applications.<sup>330</sup> Second, a court must conclude that efficient licensing and attendant widespread accessibility has not and is not likely to occur. This means that voluntary, reasonable, and nondiscriminatory licensing, either directly by the patentee, as with the Cohen-Boyer patent on gene splicing, or as mediated by an SSO,<sup>331</sup> would not trigger a liability rule. This proposal allows parties to voluntarily license their patented infrastructure widely, but preserves the threat of a damages rule as a backstop if such licensing does not arise.

This framework particularly addresses strategic behavior by patent trolls. In his concurring opinion in *eBay*, Justice Kennedy discussed patent trolls—firms that hold but do not practice patents, generating revenue through license fees and suing other firms for infringement.<sup>332</sup> Such firms routinely use the threat of an injunction to inflate their licensing fees and proposed settlement amounts.<sup>333</sup> Since trolls do not practice inventions, infringement by competitors does not erode their market share, thus rendering damages an adequate remedy. For this and the reasons mentioned above, the relative

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<sup>330</sup> Frischmann, *Economic Theory*, *supra* note 7, at 956. These factors suggest an implicit fourth factor characterizing infrastructure: lack of adequate substitutes. For example, the industry-wide “irreversible investments” made in adopting a patented standard such as JPEG may render other potential standards inadequate substitutes. *See* Lemley, *Patent Holdup of Standards*, *supra* note 296, at 154. In other cases, the unique properties of the infrastructural invention, as with human embryonic stem cells, make it nearly impossible to substitute. In still other cases, the sheer technological ingenuity of an invention both helps it enable a wide array of downstream applications and renders any potential substitutes inadequate, as with gene splicing.

<sup>331</sup> Lemley, *Patent Holdup of Standards*, *supra* note 296, at 156-57.

<sup>332</sup> 126 S.Ct. at 1842 (“An industry has developed in which firms use patents not as a basis for producing and selling goods but, instead, primarily for obtaining licensing fees.”) (Kennedy, J., concurring).

<sup>333</sup> *See* Lemley & Weiser, *supra* note 302, at 795.

hardship of an injunction would weigh heavily in favor of defendants. In addition, allowing firms that do not even practice their patents to exploit social reliance on these inventions to charge supracompetitive prices does not serve the public interest. Applying a liability rule to patented intellectual infrastructure held by trolls will help mitigate their threats of holdout.

This proposal differs from others that would simply relegate infrastructural assets to the public domain.<sup>334</sup> This latter approach is consistent with genericity, the idea-expression dichotomy, and the prohibition against patenting natural laws, physical phenomena, and abstract ideas, all of which provide open access to intellectual infrastructure. However, “cooked” infrastructure, like some of the “raw” infrastructure just mentioned, is costly to develop.<sup>335</sup> As Frischmann and Lemley recognize, equating infrastructure with open access makes sense on the demand side, but neglects the supply-side problem of provisioning.<sup>336</sup> My proposal helps balance demand-side needs for enhanced access to infrastructure with supply-side needs for dynamic incentives to invent by compelling an infringer of intellectual infrastructure to pay damages to the patentee.<sup>337</sup>

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<sup>334</sup> Cf. Frischmann, *Economic Theory*, *supra* note 7, at 922-23; Frischmann & Lemley, *supra* note 10, at 282 (“Frischmann’s organizing heuristic is ‘if infrastructure, then commons.’”).

<sup>335</sup> Interestingly, some courts have assumed that patent incentives are not necessary for discovering or generating natural laws, physical phenomena, and abstract ideas. *See* *Katz v. Horni Signal Manufacturing Corp.*, 145 F.2d 961, 961 (2d Cir. 1944) (footnote omitted).

<sup>336</sup> Frischmann & Lemley, *supra* note 10, at 282 (“One cannot automatically make the infrastructure-commons equation, particularly where IP is concerned, since producers need some incentive to innovate.”).

<sup>337</sup> Several options exist for what *kind* of liability rule to impose. For firms that first licensed widely and then restricted access, damages based on prior licensing history would be appropriate. The lower bound for damages would enable the patentee to recoup average fixed costs. *See* Lemley, *Free Riding*, *supra* note 21, at 1065. Disgorging all profits based on unjust enrichment would overly deter unlicensed use of patented infrastructure and would thus be inappropriate. *See* Mark Schankerman & Suzanne Scotchmer, *Damages and Injunctions in Protecting Intellectual Property*, 32 *RAND J. ECON.* 199 (Spring 2001) (arguing that a damages rule based on unjust enrichment deters infringement of research tool patents more than one based on lost profits).

This proposal also differs from a compulsory licensing scheme, where Congress or an agency would determine pre-set fees for using patented infrastructure.<sup>338</sup> It is not clear how a rule-making body would define, a priori, the kinds of inventions that should be subject to infrastructural treatment. Given the rapid dynamics of the biotechnology and information technology sectors, and the fact that infrastructural status is highly contextual, courts are in a better position to recognize infrastructural uses of patented technology on a case-by-case basis. Further arguing against compulsory licenses is Rob Merges's observation that such licenses discourage industry players from resolving patent issues through voluntarily negotiations.<sup>339</sup> The availability of an ex post liability rule leaves enough flexibility (and uncertainty) ex ante to motivate parties to negotiate a license before infringement, if feasible.

However, high transaction costs are likely to complicate or even prevent negotiations, thus illustrating another benefit of the liability rule approach. It is well-recognized that the threat of an injunction often leads a patentee and potential infringers to voluntarily negotiate licenses.<sup>340</sup> This arrangement is generally preferable to having a third party, such as a court or Congress, determine the license fee.<sup>341</sup> However, voluntary bargaining in the shadow of an injunction is most likely to arise when there are relatively few parties and transaction costs are low.<sup>342</sup> If many unrelated parties want to license an infrastructural invention for a wide variety of purposes, negotiation may be prohibitively

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<sup>338</sup> See, e.g., 17 U.S.C. § 115 (establishing a compulsory licenses fee schedule for recording cover songs).

<sup>339</sup> Robert P. Merges, *Contracting into Liability Rules: Intellectual Property Rights and Collective Rights Organizations*, 84 CAL. L. REV. 1293 (1996) [hereinafter Merges, *Liability Rules*].

<sup>340</sup> *Id.* at 1296.

<sup>341</sup> *Id.*

<sup>342</sup> This phenomenon is well-theorized in nuisance law, where courts are more likely to award damages in cases involving numerous plaintiffs because transaction costs would prevent an enjoined polluter from negotiating an optimal “nuisance price” with plaintiffs.

expensive, thus counseling for a liability rule.<sup>343</sup> While collective rights organizations and SSOs have shown promise in overcoming these transaction cost problems,<sup>344</sup> the persistent problem of patent holdup suggests the need for a judicial liability rule as a backstop.

The range of patented technologies that would qualify as intellectual infrastructure and liability rule protection would be small but significant. Familiar examples include gene splicing, human embryonic stem cells, and information technology standards.<sup>345</sup> Comparing these technologies, moreover, suggests two potential forms of this proposal. The first, more modest, approach permits a liability rule to serve as a backstop to *maintain* the availability of patented intellectual infrastructure that the patentee has already licensed widely. Low-cost licensing of gene splicing and no-cost licensing of the JPEG standard engendered widespread adoption and reliance, helping these assets become infrastructure. The availability of a liability rule would help prevent patentees from subsequently exploiting this social reliance by significantly raising the cost of licenses or otherwise restricting access, a strategy that Forgent and Cetus attempted with the JPEG standard and PCR, respectively.<sup>346</sup> My approach is conceptually related to estoppel, but would not require the element of deception by the patentee typically required by that equitable defense.<sup>347</sup> The threat of a liability rule would encourage patentees of infrastructural inventions to continue licensing them widely. Furthermore, a track history of licensing fees would make calculating damages

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<sup>343</sup> Calabresi & Melamed, *supra* note 14.

<sup>344</sup> Merges, *Liability Rules*, *supra* note 339, at 1300.

<sup>345</sup> *See supra* Part III.D.

<sup>346</sup> *See supra* note 294.

<sup>347</sup> *See Studiengesellschaft Kohle mbH v. Eastman Kodak Co.*, 616 F.2d 1315, 1325 (5th Cir. 1980) (“[Estoppel] ‘arises only when one has so acted as to mislead another and the one thus misled has relied upon the action of the inducing party to his prejudice.’”) (quoting *Lebold v. Inland Steel Co.*, 125 F.2d 369, 375 (7th Cir. 1941)).

relatively manageable. In this manner, the custom of biomedical researchers and software developers to use infrastructural assets would remain undisturbed, like the public's tradition of using a particular open field for a communal dance.<sup>348</sup>

However, correlating a liability rule with widespread adoption may discourage a patentee from licensing an infrastructural invention widely in the first place, which is clearly not an ideal outcome. Therefore, a second, more ambitious version of this proposal posits that patented inventions whose limited licensing has demonstrated the *potential* for infrastructural status should be protected by a liability rule.<sup>349</sup> For example, while licensed somewhat selectively, the early availability of human embryonic stem cells has established their immense potential as inputs into a wide array of biomedical applications. Given that exclusive rights should not unduly restrict access to infrastructure, a liability rule here would be appropriate. Again, an existing track history of licensing (albeit a more limited one) can serve as a rough guide for calculating infringement damages. In tandem, these two proposals address the chicken-and-egg problem of what comes first, widespread social adoption or infrastructural status. Inventions that have achieved infrastructural status, as well as those that would achieve that status “but for” restrictions in access, would both be subject to liability rule protection.

In sum, I suggest two tiers of patent protection. Patented intellectual applications, such as end-user consumer goods, would be subject to traditional property rule protection. Patented intellectual infrastructure, inputs in innovation markets that have

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<sup>348</sup> See Rose, *The Comedy of the Commons*, *supra* note 12, at 760.

<sup>349</sup> Cf. Philip J. Weiser, *The Internet, Innovation, and Intellectual Property Policy*, 103 COLUM. L. REV. 534, 593 (2003) (“[I]f it seems clear that a single standard will emerge as dominant, the law should facilitate competition within . . . the platform standard by allowing horizontal access.”).

wide downstream applicability, would be subject to a liability rule if they are not otherwise widely available through voluntary licensing.

## **B. Courts' Attentiveness to Downstream Progress in the Wake of *eBay***

Early decisions in the wake of *eBay* reflect courts' newfound attentiveness to the phenomenon of downstream productivity, thus supporting the proposal advanced here. In *z4 Technologies v. Microsoft*, a jury found that Microsoft's Windows and Office software products infringed z4's patents on software activation technology.<sup>350</sup> However, the district court denied z4's request for injunctive relief. Applying the balance of hardships test, the court observed that an injunction against Microsoft would necessitate re-releasing 450 versions of Office and 600 versions of Windows.<sup>351</sup> The court concluded that damages could compensate z4's lost profits and held that the balance of hardships favored Microsoft.<sup>352</sup> Regarding the public interest, the court gave substantial weight to the widespread use of Windows and Office and the worldwide implications of a mandatory re-release.<sup>353</sup> The court found that enjoining Microsoft could cause a "minor disruption" in distributing its products "and would have an effect on the public due to the public's undisputed and *enormous reliance* on these products."<sup>354</sup> Given widespread adoption by the public at large, and the potentially significant productivity losses from a re-release, the court concluded that the public interest weighed *against* enjoining

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<sup>350</sup> 434 F. Supp. 2d 437, 444 (E.D. Tex. 2006). The jury also found that Autodesk had infringed z4's patents.

<sup>351</sup> *Id.* at 442.

<sup>352</sup> *Id.* at 443.

<sup>353</sup> *Id.* ("Microsoft's Windows and Office software products are likely the most popular software products in the world.").

<sup>354</sup> *Id.* at 443-44 (emphasis added).

Microsoft's infringement.<sup>355</sup> Considerations of downstream productivity based on widespread social practice and public reliance led the court to protect *z4*'s patented invention with a liability rule rather than a property rule.

Similarly, in *Paice v. Toyota Motor Corp.*, a jury found that Toyota had infringed Paice's patents on hybrid engine technology, but the district court denied Paice's request for an injunction.<sup>356</sup> Invoking *eBay*, the court noted that the balance of hardships favored Toyota.<sup>357</sup> If Paice received the permanent injunction, "[t]he burgeoning hybrid market could . . . be stifled as the research and expense of bringing [Toyota's] product line to market would be frustrated."<sup>358</sup> Ultimately, concerns for follow-on productivity led the court to protect Paice's patented invention with a damages rule rather than an injunction.

Of course, one must place these decisions in context. Paice was arguably a patent troll, as it did not actually practice the patents it was suing upon.<sup>359</sup> Additionally, in both cases, the patented technologies represented a relatively small component of larger inventions—Microsoft Office and Windows in *z4* and hybrid cars in *Paice*.<sup>360</sup> These factors will not apply in many cases where a patentee is suing to enjoin infringement of patented intellectual infrastructure.

In one important way, however, these decisions go beyond the thesis developed here. Significantly, neither *z4* nor *Paice* involved intellectual infrastructure. Both inventions are nonrival inputs into downstream development. However, while the product activation component at issue in *z4* was ultimately widely used, neither it nor the

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<sup>355</sup> *Id.* at 444.

<sup>356</sup> 2006 WL 2385139 (E.D. Tex. 2006).

<sup>357</sup> *Id.* at \*6.

<sup>358</sup> *Id.*

<sup>359</sup> *Id.* at \*2 ("Plaintiff does not manufacture competing vehicles, but rather is geared toward licensing its technology.").

<sup>360</sup> 434 F. Supp. 2d at 441; *see eBay*, 126 S. Ct. at 1842.

hybrid transmission claimed in *Paice* is so foundational to a broad array of exploitations that they represent infrastructural assets. They were direct inputs for end-user goods, either software or cars. Unlike infrastructural assets like gene splicing, human embryonic stem cells, and standards, these technologies do not *enable* wide swaths of downstream productivity in innovation markets. The fact that concern for follow-on progress motivated courts to protect non-infrastructural inventions with liability rules renders it even more plausible, *a fortiori*, that they should protect infrastructural inventions with liability rules. After all, enhanced access to infrastructure generally generates even higher social returns than enhanced access to other types of inputs.

### **C. Advantages Relative to Current Practice and Other Intellectual Property Disciplines**

Allowing courts to consider a patented invention's status as intellectual infrastructure in determining whether to extend liability or property rule protection has several advantages.

First, relative to the idea-expression dichotomy, this approach offers a more intellectually honest means of protecting intellectual infrastructure. Courts generally take a functional approach to the idea-expression dichotomy, labeling something an idea simply because they feel it should be preserved in the public domain.<sup>361</sup> Similarly, courts could simply take a functional approach to interpreting natural laws, physical phenomena, and abstract ideas in order to keep certain technologies in the public domain.<sup>362</sup> For example, courts could label human embryonic stem cells as unpatentable

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<sup>361</sup> See *supra* notes 216-219 and accompanying text.

<sup>362</sup> See Lee, *Inverting the Logic of Scientific Discovery*, *supra* note 4.

“natural phenomena” and describe information technology standards as “abstract ideas” in order to deny upstream exclusivity and promote downstream progress. While the underlying structure of patent law supports such an interpretation,<sup>363</sup> it is prone to criticisms applying to the idea-expression dichotomy as being subjective and lacking analytical rigor.<sup>364</sup> Something is not an idea *because* it should be in the public domain. Similarly, the JPEG standard does not become an abstract idea simply because its broad utility counsels that it should be widely available. Following *Diamond v. Diehr*, it would be better to retain some analytical rigor around the threshold categories of patentable subject matter and reserve further determinations of intellectual infrastructure for a separate inquiry.<sup>365</sup>

Second, relative to current patent practice, determining intellectual infrastructure at the point of infringement would allow courts to consider valuable social data when identifying infrastructural inventions. The PTO initially considers intellectual infrastructure at the time of patent issuance. At this point, it is relatively easy to determine the formal “first layer” of intellectual infrastructure by inquiring if the patent claims a natural law, physical phenomena, or abstract idea. At this early stage, however, it is almost impossible to predict what “cooked” inventions will become so widely-adopted and so indispensable for downstream development that they should qualify for liberalized access. The invention at that time simply lacks the track history necessary to make such a determination. Analyzing intellectual infrastructure at the time of infringement allows time to build up a track history of demonstrated social adoption and reliance, as well as an informative track history of licensing.

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<sup>363</sup> *Id.*

<sup>364</sup> See notes 208-214 and accompanying text.

<sup>365</sup> 450 U.S. 175, 190 (1981).

Third, folding the infrastructural inquiry into remedies analysis allows for highly specific remedies. Greater consideration of context and a rejection of bright line, formalistic rules lie at the heart of *eBay*.<sup>366</sup> As we have seen, what is infrastructure in one context may be protectable application in another. Thus in *Bayer Co. v. United Drug Co.*, the word “aspirin” was generic for lay consumers but a particularized trademark for chemists, physicians, and druggists.<sup>367</sup> Similarly, in copyright, a Swiss bank account may constitute a scene a faire in an international espionage story, but may be protectable expression in a tale about invading aliens. Accordingly, using patented infrastructural technology for non-infrastructural uses would not trigger liability rule protection. This is not a “pay-for-play” compulsory license scheme in which certain patented inventions would be available for all uses as long as users paid a certain fee.<sup>368</sup> If, for example, a researcher used patented human embryonic stem cells for a line of research for which adult stem cells were adequate substitutes, then infrastructural treatment and liability rule protection would not apply.

#### **D. Potential Critiques and Responses**

Of course, this proposal must address several critiques. First, differentiating between intellectual application and infrastructure is highly technical and raises

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<sup>366</sup> 126 S.Ct. at 1839.

<sup>367</sup> 272 F. 505 (S.D.N.Y. 1921).

<sup>368</sup> This approach has some similarities to the fair use doctrine that Maureen O’Rourke suggests for patent law. See O’Rourke, *supra* note 15. However, my proposal differs from O’Rourke’s in both ends and means. O’Rourke, writing before *eBay*, recommended sui generis Congressional action to codify a fair use defense for patent law. Here, I situate infrastructure analysis within the now-existing *eBay* framework, which itself draws upon traditional equitable principles. See *id.* at 1210. Additionally, while O’Rourke focuses on the fair use doctrine’s emphasis on market failure, I draw from parallel regimes of relaxed protection of intellectual infrastructure in trademark, copyright, and patent.

institutional competence questions for courts.<sup>369</sup> However, the downstream productivity analyses in *z4* and *Paice* suggest that courts are capable of determining when liberalized access is warranted for patented upstream infrastructure.<sup>370</sup> Courts' expertise in finding and analyzing facts is particularly relevant in this endeavor. Just as courts in genericide cases consider market data, consumer surveys, and industry information in determining whether a trademark has become generic, courts in patent cases could consider similar evidence to determine whether a particular use of a patented invention is infrastructural. To address technical limitations, courts may also consider input from expert witnesses, SSOs, and specialized agencies.<sup>371</sup> Indeed, courts' experience in contextual fact-finding underscores one advantage of a judicially-mediated approach relative to agencies creating a priori, categorical rules. As mentioned, courts can tailor their factual considerations to differentiate between multiple uses of an invention, privileging only those that are infrastructural.

Second, losing the threat of an injunction upon widespread adoption of a patented infrastructural technology compromises a patentee's incentives to develop that invention in the first place.<sup>372</sup> This decreases incentives to invent precisely the kind of "infrastructural" or "paradigmatic" inventions that contribute most to technological progress.<sup>373</sup> However, aside from any explicit consideration of intellectual infrastructure,

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<sup>369</sup> See Lemley & Weiser, *supra* note 302, at 839-41.

<sup>370</sup> See *supra* Part IV.B.

<sup>371</sup> See Lemley & Weiser, *supra* note 302, at 839-41.

<sup>372</sup> Frischmann, *Economic Theory*, *supra* note 7, at 946; Lemley, *Free Riding*, *supra* note 21; see Lemley & Weiser, *supra* note 302, at 798.

<sup>373</sup> See Lee, *Paradigm Shifts*, *supra* note 269 (observing that, at a macroscopic level, strict patent protection of upstream assets may encourage paradigm shifts at the level of basic theory, thus helping science advance in the most revolutionary way). The analysis here and in my earlier work calling for increased access to upstream access must be balanced against the rare but significant gains to be achieved from paradigm shifts resulting from compelling inventors to "design around" existing infrastructure. See Lee, *Inverting the Logic of Scientific Discovery*, *supra* note 4.

*eBay* already introduces uncertainty into how courts will resolve patent infringement suits.<sup>374</sup> Firms now face a general risk that their patented inventions will be protected by a liability rule rather than a property rule upon infringement. Uncertainty is the price for flexibility, and my proposal simply applies this flexibility towards the helpful direction of allowing courts to recognize patented infrastructure and protect it accordingly.

Additionally, damages awards mitigate the provisioning problem. This proposal does not completely eviscerate incentives to invent, as an infringer would still have to compensate the patentee—in some cases on terms the patentee has previously approved.

Second, awarding damages gives rise to complicated valuation problems.<sup>375</sup> Calculating appropriate infringement damages will be particularly difficult given the complexity of valuing infrastructure.<sup>376</sup> However, under the more modest approach, damages will correlate with previous licensing fees already adopted by the patentee. Even under the more aggressive approach, a limited history of licensing would help guide courts in calculating infringement damages. While calculating damages remains an important obstacle, it does not appear to be insurmountable. Again, courts could also consider the input of expert witnesses, SSOs and agencies to help determine and administer appropriate liability rule regimes.<sup>377</sup>

My proposed application of the *eBay* framework would bring patent law closer to its intellectual property siblings in accommodating the evolution of intellectual infrastructure. One could liken it to a doctrine of genericide for patents. If an invention

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<sup>374</sup> See Lemley, *Patent Holdup of Standards*, *supra* note 296, at 167; *but see* *eBay*, 126 S. Ct. at 1841-42 (suggesting that a “long tradition of equity practice” would lead courts to continue granting injunctions in most patent infringement cases) (Roberts, C.J., concurring).

<sup>375</sup> See Henry E. Smith, *Property and Property Rules*, 79 N.Y.U. L. REV. 1719 (2004) (arguing that information costs and the difficulties of calculating damages render property rules more advantageous than liability rules).

<sup>376</sup> Frischmann, *Economic Theory*, *supra* note 7, at 958.

<sup>377</sup> See Lemley & Weiser, *supra* note 302, at 840-41.

becomes indispensable for a wide range of downstream exploitation, the patentee's exclusive rights over it become attenuated. In a sense, innovative firms would be punished by creating technologies that are so useful that they attain the status of infrastructure. This is analogous to genericide, where widespread use of a trademarked name can produce a term that is so valuable for general linguistic purposes that it loses its trademark status.<sup>378</sup> One could also analogize this proposal to a doctrine of scenes a faire for patent. If a patented invention becomes “stock” or “standard” for conducting a particular line of valuable downstream research, it becomes subject to liberalized access.<sup>379</sup>

The main difference distinguishing this approach from genericide and the idea-expression dichotomy is the use of liability rules, which are necessary to solve the provisioning problem of developing new inventions.<sup>380</sup> *eBay* thus solves two problems. It allows for a nuanced, contextual, and historical evaluation of whether a patented invention represents intellectual infrastructure at the time of infringement. It also offers the flexibility of protecting that invention with a liability rule, thus balancing incentives to invent with access to foundational resources that facilitate invention.

Ultimately, intellectual infrastructure and its responsiveness to evolving social practice reveal a natural limitation on intellectual property rights. Firms, authors, and

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<sup>378</sup> See *supra* Part III.A.

<sup>379</sup> This proposal is conceptually similar to antitrust law's essential facilities doctrine, which “imposes liability when one firm, which controls an essential facility, denies a second firm reasonable access to a product or service that the second firm must obtain in order to compete with the first.” *Alaska Airlines, Inc. v. United Airlines, Inc.*, 948 F.2d 536, 542 (9th Cir. 1991). See *Frischmann, Economic Theory*, *supra* note 7, at 963; see generally Robert Pitofsky, *The Essential Facilities Doctrine Under United States Antitrust Law*, at <http://www.ftc.gov/os/comments/intelpropertycomments/pitofskyrobert.pdf>; cf. Lee, *Inverting the Logic of Scientific Discovery*, *supra* note 4, at 84 (arguing that substitutability is one factor courts should consider liberalizing access to patented research tools).

<sup>380</sup> Lemley & Weiser, *supra* note 302, at 785 (“Stated simply, where property rules have pernicious consequences, liability rules look better by comparison.”).

inventors can receive exclusive rights over their creations, but those rights may not confer *too* much power. At a primary level, certain “raw” inputs, such as words, ideas, and natural properties, are preserved in the public domain as intellectual infrastructure. Infrastructure, however, is socially defined and consequently evolves. Firms may trademark names, but if those names enter the vernacular, they become generic words open to the public. Authors may copyright their individual expressions, but well-traveled modes of expression considered “stock” or “standard” are not protectable. Under the proposal here, inventions that become intellectual infrastructure would be open to the development community on a liberalized basis. Society at large, which imbues these creations with value, has certain claims on their availability.<sup>381</sup> Where the community holds its public dances matters, and may limit the exclusive rights claimed by the landowner.

## **Conclusion**

Trademark, copyright, and patent law all distinguish between upstream intellectual infrastructure and downstream intellectual application. This is a distinction between the raw and the cooked. Trademark reserves generic words for free use by society and only allows exclusive rights for individualized terms. Copyright preserves ideas in the public domain, only granting protection over particularized expressions. Patent law maintains the free availability of natural laws, physical phenomena, and abstract ideas while permitting ownership of refined inventions. Intellectual

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<sup>381</sup> See Rochelle Cooper Dreyfuss, *We are Symbols and Inhabit Symbols, So Should We Be Paying Rent? Deconstructing the Lanham Act and Rights of Publicity*, 20 COLUM.-VLA J.L. & ARTS 123, 142 (1996).

infrastructure, which comprises nonrival assets that facilitate widespread downstream productivity, remains open to all.

Infrastructure, however, evolves to serve changing social practices and needs. Accordingly, this Article has compared doctrines defining intellectual infrastructure based on their sensitivity to social context and evolution. An interesting continuum emerges. The trademark doctrine of genericide is highly attentive to social change, and relies on consumer surveys, market data, brochures, and dictionaries to determine if and when a protected mark has become a generic word. Copyright occupies an intermediate position. As society's notion of "stock" elements evolves, so does the definition of what is freely available to subsequent authors as open infrastructure. Patent law occupies the far end of the spectrum, and takes a narrow and rigid approach to defining intellectual infrastructure. As such, it does not accommodate the reality that certain patented assets can shift from mere "cooked" inventions to "raw" materials warranting more liberalized access.

This Article has drawn on *eBay v. MercExchange* to argue that courts should take a more functional approach to defining and protecting intellectual infrastructure when determining patent infringement remedies.<sup>382</sup> In short, it argues for a two-tiered system: property rule protection for patented intellectual applications and liability rule protection, where appropriate, for patented intellectual infrastructure. This "infrastructure test" is explicitly functional in nature, and avoids the disingenuousness of unduly manipulating the definition of natural laws, physical phenomena, and abstract ideas to keep basic infrastructure in the public domain. Furthermore, situating this analysis in the context of

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<sup>382</sup> Articulating a similar theme, the Supreme Court recently replaced the Federal Circuit's "formalistic" approach to determining nonobviousness with an "expansive and flexible approach." *KSR Int'l v. Teleflex Inc.*, 127 S Ct. 1727, 1739 (2007).

patent infringement, rather than relying on the PTO's determinations of patentable subject matter upon issuance, allows courts to consider an invention's track history in determining whether it warrants liability rule protection. Additionally, case-specific analysis allows courts to craft contextually specific, targeted remedies. While this approach has general application to patented infrastructure, it has particular salience to certain foundational patented inventions in biotechnology and information technology.

Comparing analogous doctrines in trademark, copyright, and patent reveals the shared mechanism of intellectual infrastructure as a natural limit on exclusive rights. Analogy to the realm of inherently public property and tangible infrastructure further reveals how infrastructure is socially defined and subject to evolution, a dynamic that patent law currently does not accommodate. Intellectual property is not a natural right, but exists to promote society-wide progress.<sup>383</sup> Rhetorical tropes such as the entrepreneurial firm, romantic author, and inventive genius have historically justified expansive intellectual property rights.<sup>384</sup> However, creating value is a reciprocal process. Society itself, through widespread adoption, use, and reliance, helps make infrastructural assets valuable, and one party should not be able to hold society hostage by restraining access to them. While allowing intellectual infrastructure doctrine to better accommodate

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<sup>383</sup> See Letter from Thomas Jefferson to Mr. Isaac M'Pherson (August 13, 1813), in 13 THE WRITINGS OF THOMAS JEFFERSON 326, 355 (Albert Ellery Bergh ed., 1907) ("Considering the exclusive right to invention as given not of natural right, but for the benefit of society, I know well the difficulty of drawing a line between the things which are worth to the public the embarrassment of an exclusive patent, and those which are not.").

<sup>384</sup> See Aoki, *Authors, Inventors and Trademark Owners Part I*, *supra* note 308; Keith Aoki, *Authors, Inventors and Trademark Owners: Private Intellectual Property and the Public Domain Part II*, 18 COLUM.-VLA J.L. & ARTS 191 (1993); JAMES BOYLE, SHAMANS, SOFTWARE, & SPLEENS 53 (1996); Litman, *supra* note 5, at 965.

the evolving needs of society still leaves important issues to be addressed,<sup>385</sup> it is one step closer to effectuating the overarching goals of the intellectual property system.

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<sup>385</sup> See Chander & Sunder, *supra* note 22; Sunder, *supra* note 1, at 273.