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A PSYCHOLOGY OF INTELLECTUAL PROPERTY

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INTRODUCTION

The U.S. Constitution grants Congress the power to promulgate laws "[t]o promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."[1]

Within the same clause and with the identical purpose of promoting innovation, Congress is authorized to grant exclusive rights in both artistic works and scientific and technological inventions. Congress has acted to provide both forms of intellectual property protection, with patent law shielding primarily scientific and technological inventions and copyright law principally covering artistic works. Despite the fact that Congress's

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[1] U.S. CONST. art. I, § 8, cl. 8.

power to create patent and copyright laws is derived from the same constitutional provision, patent and copyright laws look very different on many dimensions.

This Article investigates the discrepancy between patent and copyright law in their protectability standards. Patent and copyright laws each require works to surmount a certain threshold of ingenuity, so that—under a utilitarian understanding of these laws—the law grants to creators the incentive of exclusive right to their work in exchange for the creation of works from which society would benefit.[2] It is thought that potential creators likely would not create in the absence of intellectual property protection guarding their work from unlicensed copying.[3] To grant protection, patent law requires inventions to meet the high hurdle of novelty, nonobviousness, and utility,[4] while copyright law requires only the lower threshold of originality.[5] Part I surveys the differences between the protectability in patent and copyright law and the previously offered explanations for these distinctions.

Making sense of this discrepancy is an important but undertheorized issue, critical to structuring intellectual property laws' protectability standards.[6] Protectability is the key to whether particular works can reap the benefits of intellectual property protection and, correspondingly, whether the availability of protection will encourage the production of such works in the first instance.[7]

Moreover, the comparison of patent and copyright law offers insight into the general role of intellectual property law and demonstrates what, if anything, patent and copyright law can teach one another.[8] Using the same theoretical approach to explain or challenge their dissimilarities indicates

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[2] Jeanne C. Fromer, *Claiming Intellectual Property*, 76 U. CHI. L. REV. 719, 731, 743 (2009).

[3] *Id.*

[4] 35 U.S.C. §§ 102–103 (2006).

[5] 17 U.S.C. § 102(a) (2006). For a discussion comparing patent and copyright standards and previous explanations of their differences, see the discussion below in Part I.C.

[6] *See* 1 PAUL GOLDSTEIN, COPYRIGHT: PRINCIPLES, LAW AND PRACTICE § 2.2.1, at 63–64 (1989); Clarisa Long, *Information Costs in Patent and Copyright*, 90 VA. L. REV. 465, 469–70, 487–89 (2004); Dale P. Olson, *Copyright Originality*, 48 MO. L. REV. 29, 34–35 (1983); John Shepard Wiley, Jr., *Copyright at the School of Patent*, 58 U. CHI. L. REV. 119, 146–47 (1991). I discuss this and other relevant scholarship below in Part I.

[7] Diane Leenheer Zimmerman, *It's an Original! (?): In Pursuit of Copyright's Elusive Essence*, 28 COLUM. J.L. & ARTS 187, 189–90 (2005).

[8] *See* Rochelle Dreyfuss, *A* Wiseguy*'s Approach to Information Products: Muscling Copyright and Patent Law into a Unified Theory of Intellectual Property*, 1992 SUP. CT. REV. 195, 221–23 (suggesting that protectability for information products be examined in a unified and functional fashion across copyright and patent law, rather than as separate regimes); Fromer, *supra* note 2, at 720–24 (exploring the different requirements for claiming a protected work under copyright and patent law to determine how those requirements affect innovation in the artistic and scientific realms, respectively); *cf.* Abraham Drassinower, *Authorship as Public Address: On the Specificity of Copyright Vis-à-Vis Patent and Trade-mark*, 2008 MICH. ST. L. REV. 199, 204 ("[T]he comparison of copyright and patent yields the proposition that authorship is a mode of communication . . . .").

that, at their foundation, patent and copyright law have more in common[9] than legal scholarship often appreciates, instead viewing patent and copyright as separate spheres of study.[10] The ability to locate such common understandings suggests that a unified theory of intellectual property could exist despite the manifest differences between patent and copyright law.

In this Article, I propose that the distinctions in the protectability standards governing patent and copyright law primarily accord with current psychological findings on creativity, even though it is unlikely that these findings actually motivated the enactment of these different legal standards. There are two reasons it is essential to look to psychological understandings of creativity in order to analyze and shape intellectual property.[11] First, if the goal of patent and copyright law is to provide an incentive to produce creative works, it is worth looking to the psychological literature that illuminates the process by which scientists and artists actually create and by

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[9] Dreyfuss, *supra* note 8, at 222 ("[P]atent is different from copyright, but not because it covers different subject matter or requires a different level of inventiveness. Rather, patent is the coverage provided to spur creativity in one group of endeavors having particular characteristics; the 'copyright industries' are structured differently, and therefore require another sort of coverage."); *cf.* Sony Corp. of Am. v. Universal City Studios, Inc., 464 U.S. 417, 439 & n.19 (1984) (using patent law to inform the law of copyright infringement because of "the historic kinship between patent law and copyright law," although "exercis[ing] . . . caution . . . in applying doctrine formulated in one area to the other").

[10] There is some other unified scholarship that considers patent and copyright laws under the same theoretical approach. *E.g.*, Dreyfuss, *supra* note 8, at 221–23; Dennis S. Karjala, *Distinguishing Patent and Copyright Subject Matter*, 35 CONN. L. REV. 439, 453–56 (2003) (suggesting that functional works ought never to be protectable by copyright law but only by patent law, as they are amenable to incremental improvements and patent law's short-term protection does not harm the pace of innovation too much); Long, *supra* note 6, at 469–70, 487–89 (theorizing that claiming requirements in patent and copyright law are different due to the different information costs of the things they protect); Henry E. Smith, *Intellectual Property as Property: Delineating Entitlements in Information*, 116 YALE L.J. 1742 (2007) (proposing that differences between copyright and patent law can be explained by references to the relative differences of delineation and enforcement of exclusion rights in them).

[11] *See infra* Part II.B. The legal literature at times takes notice of psychological research to apply to intellectual property. *Cf.* Rochelle Cooper Dreyfuss, *The Creative Employee and the Copyright Act of 1976*, 54 U. CHI. L. REV. 590, 605–26 (1987) [hereinafter Dreyfuss, *Creative Employee*] (assessing copyright's work-for-hire doctrine's effect on authors' creativity). One notable application is to patent law's nonobviousness requirement. *See* Janet Davidson & Nicole Greenberg, *Psychologists' Views on Nonobviousness: Are They Obvious?*, 12 LEWIS & CLARK L. REV. 527 (2008); R. Keith Sawyer, *Creativity, Innovation, and Obviousness*, 12 LEWIS & CLARK L. REV. 461 (2008); Colleen M. Seifert, *Now Why Didn't I Think of That? The Cognitive Processes that Create the Obvious*, 12 LEWIS & CLARK L. REV. 489 (2008); Steven M. Smith, *Invisible Assumptions and the Unintentional Use of Knowledge and Experiences in Creative Cognition*, 12 LEWIS & CLARK L. REV. 509 (2008). Another maps findings of cognitive science to trademark law. *See, e.g.*, Rochelle Cooper Dreyfuss, *Expressive Genericity: Trademarks as Language in the Pepsi Generation*, 65 NOTRE DAME L. REV. 397, 412–24 (1990) (applying findings from psycholinguistics that words can be open-textured to trademark law's doctrine of genericity); Rebecca Tushnet, *Gone in Sixty Milliseconds: Trademark Law and Cognitive Science*, 86 TEX. L. REV. 507, 527–68 (2008) (arguing that associationist models of cognition are flawed and ought not to inform the law of trademark dilution).

which individuals appreciate creative works.[12] Second, most legal and economic scholarship on intellectual property has not been able to explain reliably how intellectual property laws affect innovation because of limitations in conducting empirical work on this issue.[13] A fresh look at how scientists and artists exercise their creativity to make valuable works—the front end of the story of intellectual property—naturally gives way to an analysis of how intellectual property laws ought to be structured to provide the proper incentive to employ this creativity. This analysis diminishes the need for a full explanation of the complex back end of the story—the law's effect on innovation.

Part II sets out the psychological literature on creativity. It suggests that the general structure of the creative process looks similar for scientists and engineers ultimately protected by patent and for artists ultimately protected by copyright.[14] The creative process includes as important steps both "problem finding" (formulating and constraining a problem) and "problem solving" (achieving a goal by removing any obstacles in the way).[15] Nonetheless, society values different steps in the creative process for scientific works and artistic works. For scientific and technological inventions, society emphasizes problem solving over problem finding, while for artistic works, it stresses problem finding over problem solving.[16] Moreover, while it is often acceptable for scientific and technological inventions to be more groundbreaking, it is psychologically preferable that artistic works be new, but not be too new.[17]

As I argue in Part III, these two differences between scientific and artistic creativity principally parallel patent law's tough standards of novelty, nonobviousness, and utility and copyright law's more minimal originality requirement. First, scientific creativity's focus on problem solving mirrors patent law's protectability standards by emphasizing how well the inventor solved a particular problem. By contrast, for artistic creativity, the focus is on the discovery of the problem rather than its solution. This emphasis fits with copyright's concept of originality, which requires only that the author has personally found a problem, which was then fixed as a work of art.

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[12] *Cf.* Dreyfuss, *Creative Employee*, *supra* note 11, at 591 ("[A]ttention to nonpecuniary, author-based interests is necessary in order to take full advantage of the talents of the creative and to, in the words of the Constitution, 'promote the Progress of Science and useful Arts.'"). Rebecca Tushnet explores artistic creators' own accounts of their creativity and the effect that ought to have on copyright law. Rebecca Tushnet, *Economies of Desire: Fair Use and Marketplace Assumptions*, 51 WM. & MARY L. REV. 513, 515 (2009) ("Psychological and sociological concepts can do more to explain creative impulses than classical economics. As a result, a copyright law that treats creativity as a product of economic incentives can miss the mark and harm what it aims to promote.").

[13] *See infra* text accompanying notes 110–11.

[14] *See infra* Part II.B.1.

[15] *See infra* Part II.B.1.

[16] *See infra* Part II.B.2–3.

[17] *See infra* Part II.B.2–3.

Second, patent law's standards of novelty, nonobviousness, and utility set a high bar for protectability. That elevated standard accords with society's frequent willingness to adopt groundbreaking inventions. By contrast, copyright's standard of originality sets the bar much lower, making it easy for artistic works to gain protection. Psychological research concluding that individuals tend to like artistic works that are new, but not too new, coincides with this standard. Were the threshold for copyrights set higher, artists might pour too much "newness"[18] into their works, something individuals in the relevant audience would have a propensity to reject. By setting the bar low, copyright law signals that some but not too much newness is beneficial, contrary to a number of recent proposals by Joseph Scott Miller, Gideon Parchomovsky, and Alex Stein.[19]

Whether or not the developers of these laws had similar psychological principles in mind in molding the protectability standards, they are principally in accord. These differing standards are also normatively desirable to the extent that the types of works protectable by each intellectual property regime match up with the psychological explanation of archetypical creativity for that regime. That is, the primary goal of patent and copyright law is to stimulate creativity valuable to society in their respective spheres. Thus, the protectability standards of patent and copyright law ought to stimulate creativity, so long as the works protected by each type of law fit the prototypical forms of creativity for that regime. It follows then, as I elaborate in Part III, that copyright law is not well equipped to handle works whose significant contribution lies in a problem solved, just as patent law is not well suited to protect works whose significant contribution lies in a problem found. Moreover, copyright law perhaps sets too low of a bar to protectability for those artistic domains in which a large degree of newness is desirable. Similarly, patent law might set too high of a bar against protectability for those scientific domains in which incremental advances are appreciated.

I. PROTECTABILITY

The protectability standards in patent and copyright law are strikingly different. Section A discusses the protectability standards of patent law and details the accepted rationales for these standards. Section B performs this same explication of the protectability standards of copyright law and the traditional grounds for such standards. Finally, section C presents the scho-

[18] Although it would be preferable to use the word *novelty* or *originality* instead of the clumsier *newness*, use of the sleeker words would create too much confusion given their terminological prominence in intellectual property law.

[19] Joseph Scott Miller, *Hoisting Originality*, 31 CARDOZO L. REV. 451, 465 (2009) (arguing that the originality requirement should be heightened to look more like patent law's nonobviousness requirement); Gideon Parchomovsky & Alex Stein, *Originality*, 95 VA. L. REV. 1505, 1506–08 (2009) (proposing how copyright law could reward authors of more creative works more heavily).

larly debate on why the standards in patent and copyright are so fundamentally different.

A. Patent Law

Before 1952, the statutory requirements for a patent were only that applicants demonstrate that their invention was novel and useful.[20] Long before 1952, however, the courts grafted on the additional requirement of showing that there was sufficient inventiveness beyond mere novelty.[21] In 1952, Congress reaffirmed the two existing statutory requirements and codified a requirement that to be patentable inventions must be nonobvious.[22] Patents are granted after successfully undergoing examination by the Patent and Trademark Office to ascertain that an invention meets patentability conditions and the description in the patent application satisfies certain disclosure requirements.[23] The patent right permits the patentee to exclude others from practicing the invention claimed in the patent for a term of typically twenty years from the date the patent application was filed.[24]

Scholars have set forth various theories to justify patent protection. Many think that patent law fulfills its utilitarian, constitutional purpose to benefit the public by allowing inventors to internalize the benefits of their works by excluding others from making and using them.[25] The theory is

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[20] John F. Duffy, *Inventing Invention: A Case Study of Legal Innovation*, 86 TEX. L. REV. 1, 34 (2007).

[21] *See id.* at 17–69 (recounting the origins and evolution of patent law's nonobviousness requirement); Edmund W. Kitch, Graham v. John Deere Co.*: New Standards for Patents*, 1966 SUP. CT. REV. 293, 303–27 (recounting three historical tests of invention in patent law). Courts grounded this requirement in the idea that an "invention" involves a change in principle beyond that which already exists. *See* Duffy, *supra* note 20, at 39–41 (citing cases).

[22] Patent Act of 1952, Pub. L. No. 82-593, 66 Stat. 792 (codified at 35 U.S.C. § 103(a) (2006)). There is also a requirement that inventions relate to patentable subject matter—a "process, machine, manufacture, or composition of matter, or any new and useful improvement thereof"—before a patent will be granted. 35 U.S.C. § 101 (2006).

[23] 35 U.S.C. § 131. The Patent Act requires disclosure of certain content within the patent by calling for a written description, enablement, and best mode. *Id.* § 112. *See generally* Jeanne C. Fromer, *Patent Disclosure*, 94 IOWA L. REV. 539, 547–94 (2009) (describing these requirements and arguing that they do not suffice for useful and clear disclosures). The written description requirement ensures that the inventor is in possession of the claimed invention. Guang Ming Whitley, Comment, *A Patent Doctrine Without Bounds: The "Extended" Written Description Requirement*, 71 U. CHI. L. REV. 617, 623 (2004). To enable the invention, the patent applicant must demonstrate in the specification to "any person skilled in the [relevant] art [how] . . . to make and use the [invention]," 35 U.S.C. § 112, without "undue experimentation." Monsanto Co. v. Syngenta Seeds, Inc., 503 F.3d 1352, 1360 (Fed. Cir. 2007). Also, the patent applicant must "set forth the best mode contemplated by the inventor of carrying out his invention." 35 U.S.C. § 112. The best mode requirement is met so long as the patent document objectively discloses the best mode that the inventor subjectively conceived by the time the inventor files the patent application, and the mode is sufficient "such that one reasonably skilled in the art could practice it." Eli Lilly & Co. v. Barr Labs., Inc., 251 F.3d 955, 963 (Fed. Cir. 2001).

[24] 35 U.S.C. § 154(a).

[25] *E.g.*, Alan Devlin, *Restricting Experimental Use*, 32 HARV. J.L. & PUB. POL'Y 599, 617–22 (2009).

that the public benefits by rewarding inventors for taking two steps they likely would not otherwise take: first, to invent and possibly commercialize; and second, to reveal information to the public about these inventions to stimulate further innovation.[26] Others see patent law as a Lockean acknowledgment of the labor of inventing by granting the patent right to inventors that have worked sufficiently hard.[27]

The accepted basis of each of patent law's requirements of novelty, nonobviousness, and utility is to distinguish (and confer patents to protect) those inventions that are valuable to society and sufficiently promote scientific progress.

The first requirement, novelty—located in section 102 of the Patent Act—requires that "the invention was [not] known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent."[28] This section also provides that there is no novelty when a published or granted U.S. patent application[29] exists before invention or another inventor creates the same work first and does not "abandon[], suppress[], or conceal[] it."[30] The justification for novelty is that the valuable patent right, broadly excluding anyone from unauthorized use of the invention for the patent term, ought not to be granted unless society benefits from it. The rationale is that there is no benefit to granting a patent for an invention if society already possesses it.[31]

The second patentability requirement, nonobviousness, is found in section 103 of the Patent Act. It states that a patent "may not be obtained . . . if

[26] Fromer, *supra* note 23, at 547–54. There are a number of variants of the utilitarian theory. One is the prospect theory, which suggests that inventors are rewarded with a patent right to centralize investment in the patented invention's commercialization and improvement, which in turn benefits society. Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 266 (1977). Another is the signaling theory, which proposes that patents are useful signals to financiers that the patenting firm is a worthy investment. Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625, 636–37, 648 (2002); Gideon Parchomovsky & R. Polk Wagner, *Patent Portfolios*, 154 U. PA. L. REV. 1, 37 (2005).

[27] *E.g.*, Wendy J. Gordon, *A Property Right in Self-Expression: Equality and Individualism in the Natural Law of Intellectual Property*, 102 YALE L.J. 1533 (1993) (suggesting that a Lockean approach to intellectual property ought to both reward creators and protect the free-speech interests of the public). Almost no one invokes the Hegelian moral rights emanating from a work as a part of the inventor's personality. *See* Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, 1031–34 (1997); *cf. infra* text accompanying note 64 (applying this theory to copyright). Roberta Kwall implies that moral rights are invoked in copyright but not much in patent law because works other than fine art "are perhaps less likely to need modifications that may ultimately conflict with the creator's artistic vision in order to serve their intended functions." Roberta Rosenthal Kwall, *Originality in Context*, 44 HOUS. L. REV. 871, 874–75 (2007).

[28] 35 U.S.C. § 102(a).

[29] *Id.* § 102(e) (excepting certain situations).

[30] *Id.* § 102(g). Certain activities postdating an invention, known as statutory bars, can also mean that the inventor loses the right to a patent. *See id.* § 102(b)–(d).

[31] Alan L. Durham, *Natural Laws and Inevitable Infringement*, 93 MINN. L. REV. 933, 955 (2009).

the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art."[32] It is thought that granting patents only for technologically significant—that is, nonobvious—advances[33] is important to furthering the patent system's goal of stimulating useful innovation in at least two ways. First, without a nonobviousness requirement, patents may be granted to inventions that are technologically trivial in light of the existing store of knowledge.[34] Patents on such inventions may impose great economic costs on society.[35] An example is George B. Selden's 1895 patent on the automobile,[36] which merely combined the already developed internal combustion gasoline engine with a chassis. The patent claimed a profitable and useful invention but was not a technologically significant leap past the engine development itself.[37] Selden arguably had an adequate economic incentive to invent the automobile without the possibility of a patent grant. Nonetheless, granting a patent to Selden significantly raised the cost of using the automobile by requiring others to license its use and by raising the costs of further innovations when others likely would have invented it nearly simultaneously.[38] The social cost of granting Selden a patent for an economically meaningful but technologically trivial invention thus exceeded the benefit of the patent's incentive to Selden to invent. Second, without a nonobviousness requirement, a profusion of technologically trivial patents might be obtained in any one domain. Collectively, this patent thicket would decrease innovation and increase social costs both by imposing significant licensing fees upon anyone working in the domain and by potentially generating expensive litigation based on accidental infringement.[39]

The third requirement, utility, is located in section 101 of the Patent Act and specifies merely that the requisite invention or discovery be "useful."[40] Although there are different ways of understanding utility,[41] it is

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[32] 35 U.S.C. § 103(a). "Prior art" is "[k]nowledge that is publicly known, used by others, or available on the date of invention to a person of ordinary skill in an art, including what would be obvious from that knowledge." BLACK'S LAW DICTIONARY 119 (8th ed. 2004).

[33] The Supreme Court understands Congress to have enacted section 103 to exclude from patentability "insignificant variations and innovations of a commonplace sort." Graham v. John Deere Co., 383 U.S. 1, 16 (1966).

[34] Duffy, *supra* note 20, at 11–18.

[35] *Id.* (discussing the burdens imposed by trivial patents).

[36] U.S. Patent No. 549,160 (filed May 8, 1879) (issued Nov. 5, 1895).

[37] ROBERT PATRICK MERGES & JOHN FITZGERALD DUFFY, PATENT LAW AND POLICY 612–14 (4th ed. 2007).

[38] *Id.* at 614–15.

[39] Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1614–15, 1627–29 (2003).

[40] 35 U.S.C. § 101 (2006).

most frequently associated with the idea that an invention must have a practical utility, meaning a specific and substantial utility.[42] According to the Supreme Court, the policy behind the utility requirement is that "[u]nless and until a[n invention] is refined and developed to th[e] point . . . where specific benefit exists in currently available form . . . there is insufficient justification for permitting an applicant to engross what may prove to be a broad field."[43] In other words, without specific utility, "a patent may confer power to block off whole areas of scientific development, without compensating benefit to the public."[44]

B. Copyright Law

Compared to protectability in patent law described above, copyright law's protectability standards appear quite different. In 1909, the Copyright Act provided that "the works for which copyright may be secured . . . shall include all the writings of an author."[45] The statutory language did not confine copyright protection only to an author's writings, nor did it express any limitations on which works were protectable. Nonetheless, in the cases that arose under this law, courts established a requirement of originality.[46] In 1976, Congress incorporated the case law's notion of originality[47] by changing copyright law to its current state to protect "original works of authorship fixed in any tangible medium of expression, now known or later developed," including literary works, sound recordings, movies, and computer software code.[48]

A copyright holder receives the exclusive right to reproduce the work, sell copies of it, and prepare derivative works, among other things,[49] typically until seventy years after the author's death.[50] Copyright protection ex-

[41] Michael Risch, *Reinventing Usefulness*, 2010 BYU L. REV. (forthcoming) (discussing operable, practical, and commercial utility).

[42] *E.g.*, *In re* Fisher, 421 F.3d 1365, 1371 (Fed. Cir. 2005).

[43] Brenner v. Manson, 383 U.S. 519, 534–35 (1966).

[44] *Id.* at 534 (footnote omitted).

[45] Copyright Act of 1909, Pub. L. No. 60-349, ch. 320, § 4, 35 Stat. 1075, 1076. Copyright law before that protected only specific categories of works, beginning in 1790 with maps, charts, and books. Act of May 31, 1790, ch. 15, § 1, 1 Stat. 124, 124.

[46] *E.g.*, Du Puy v. Post Tel. Co., 210 F. 883, 884–85 (3d Cir. 1914); *see also* Russ VerSteeg, *Sparks in the Tinderbox:* Feist*, "Creativity," and the Legislative History of the 1976 Copyright Act*, 56 U. PITT. L. REV. 549, 579–85 (1995) (citing cases).

[47] Copyright Act of 1976, Pub. L. No. 94-553, § 102(a), 90 Stat. 2541, 2544 (codified at 17 U.S.C. § 102(a) (2006)).

[48] 17 U.S.C. §§ 101, 102(a). To obtain copyright protection, copyright holders need not do more than create an original work. There is no longer a requirement that a work be published to be protected. *Id.* § 102 (requiring only that a work be fixed in "any tangible medium of expression" to be copyrightable).

[49] *Id.* § 106 (granting the right to prepare derivative works; rent, lease, or lend works; perform works publicly; display works; and digitally transmit works).

[50] *Id.* § 302(a).

tends to the expression of particular ideas rather than to the ideas themselves.[51] Yet protection actually reaches well beyond the literal work to works that are copied and substantially similar,[52] "else a plagiarist would escape by immaterial variations."[53]

The Supreme Court's most recent formulation of the originality requirement occurred in *Feist Publications, Inc. v. Rural Telephone Service Co.*,[54] a case involving the copyrightability of a local telephone directory listing names in alphabetical order along with their towns and telephone numbers.[55] The *Feist* Court held that work is original so long as it "was independently created by the author (as opposed to copied from other works), and that it possesses at least some minimal degree of creativity."[56] The requisite level of creativity, according to the Supreme Court, "is extremely low; even a slight amount will suffice."[57] A work must merely evidence "intellectual production, . . . thought, and conception."[58] Originality does not match up to a requirement of true novelty; a minimally creative work is protectable even if there is a nearly identical work, so long as the other work was not copied.[59] As Judge Learned Hand observed, "[I]f by some magic a man who had never known it were to compose anew Keats's *Ode on a Grecian Urn*, he would be an 'author,' and, if he copyrighted it, others might not copy that poem, though they might of course copy Keats's."[60] It

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[51] *Id.* § 102(b) ("In no case does copyright protection . . . extend to any idea . . . regardless of the form in which it is described."); *see also* Nichols v. Universal Picture Corp., 45 F.2d 119, 121 (2d Cir. 1930) (holding that the copyright in a play does not extend to the play's ideas). According to the Supreme Court, the idea–expression dichotomy "strike[s] a definitional balance between the First Amendment and the Copyright Act by permitting free communication of facts [and opinions] while still protecting an author's expression." Harper & Row, Publishers, Inc. v. Nation Enters., 471 U.S. 539, 556 (1985) (internal quotation marks omitted).

[52] Corwin v. Walt Disney Co., 475 F.3d 1239, 1253 (11th Cir. 2007); Whitehead v. Paramount Pictures Corp., 53 F. Supp. 2d 38, 46 (D.D.C. 1999).

[53] *Nichols*, 45 F.2d at 121.

[54] 499 U.S. 340 (1991).

[55] *Id.* at 342.

[56] *Id.* at 345. Some scholars think the Supreme Court was wrong to require minimal creativity to find originality, particularly because earlier drafts of the 1976 Act had included and then rejected a standard of creativity. *E.g.*, VerSteeg, *supra* note 46, at 551. According to this history, a creativity standard was removed from the statutory draft because of overwhelming complaints that it would raise the copyrightability standard too high and that its definition would be too difficult. *Id.* at 558–66. On the opposite side of the fence, other scholars think that *Feist* properly set the originality standard to accord with the Constitution's minimal requirements for copyright. *E.g.*, Zimmerman, *supra* note 7, at 205–06.

[57] *Feist*, 499 U.S. at 345. Some older decisions reasoned otherwise, finding that copyright ought to be bestowed only on very creative works, of the type that "requir[e] genius for [their] construction." Jollie v. Jacque, 13 F. Cas. 910, 913 (C.C.S.D.N.Y. 1850) (No. 7437) (Nelson, J.).

[58] *Feist*, 499 U.S. at 362 (internal quotation marks omitted).

[59] *Id.* at 345–46.

[60] Sheldon v. Metro-Goldwyn Pictures Corp., 81 F.2d 49, 54 (2d Cir. 1936). Others might copy Keats's poem because any copyright on it has long expired, leaving the work in the public domain. John C. O'Quinn, *Protecting Private Intellectual Property from Government Intrusion: Revisiting* SmithKline *and the Case for Just Compensation*, 29 PEPP. L. REV. 435, 504 n.455 (2002).

is thus the rare work that will not meet the low threshold of originality. For example, the Court held that the telephone directory in *Feist* was insufficiently original because its factual raw data did not owe its existence to the directory creator and the selection and alphabetical arrangement of the directory entries was not creative enough.[61] The threshold for copyright protection is thus minimal but not absent.

Scholars set forth various theories to justify copyright protection, which are nearly indistinguishable from those raised for patent. Many see copyright as aligned with its utilitarian, constitutional purpose to benefit the public by allowing authors of artistic works to internalize the benefits of these works and prohibit most substantially similar copied works.[62] Others see copyright as a Lockean acknowledgment of the labor of authorship by granting copyright to authors that have worked sufficiently hard[63] or of Hegelian moral rights in the sense that a copyrightable work is an extension of the author's personality.[64]

In light of these overarching theories of copyright, there are two dominant notions of the originality requirement's basis.[65] Some theorize that originality's low threshold combined with the copyright incentive will tend to yield the creation of a vast number of protected works, benefiting both society with a vast cultural library[66] and authors who can earn a living for doing something society adjudges valuable.[67] A stricter standard would in-

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[61] *Feist*, 499 U.S. at 361–64. As another illustration, the Ninth Circuit held that a lamp design made up of preexisting parts was not sufficiently original to qualify for copyright protection. Lamps Plus, Inc. v. Seattle Lighting Fixture Co., 345 F.3d 1140, 1146–47 (9th Cir. 2003).

[62] *E.g.*, Jeffrey L. Harrison, *Rationalizing the Allocative/Distributive Relationship in Copyright*, 32 HOFSTRA L. REV. 853, 855 (2004); William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 J. LEGAL STUD. 325, 326 (1989).

[63] *E.g.*, Gordon, *supra* note 27.

[64] *E.g.*, Lawrence C. Becker, *Deserving to Own Intellectual Property*, 68 CHI.-KENT L. REV. 609 (1993). This theory is more popular in Europe than in the United States. *See* Cyrill P. Rigamonti, *Deconstructing Moral Rights*, 47 HARV. INT'L L.J. 353, 359–67 (2006) (describing laws in France, Germany, and Italy as providing authors with inalienable rights to disclosure, attribution, integrity, and withdrawal). Despite these theories, the origins of American copyright law suggest that it was a form of trade protectionism. Zimmerman, *supra* note 7, at 196.

[65] There is also a third view. Doug Lichtman hypothesizes that the purpose of the originality requirement is evidentiary, in the sense that it "empowers courts to exclude from the copyright system a particularly messy class of cases: those in which courts would not be able to use similarity as the basis for even a weak inference regarding the likelihood of impermissible copying." Douglas Lichtman, *Copyright as a Rule of Evidence*, 52 DUKE L.J. 683, 687 (2003). That is, it is complex, if not impossible, to determine whether one author of local restaurant listings copied from another as compared with the easier case of determining whether a songwriter copied the lyrics or melody from another. *See id.* at 686–87.

[66] 1 GOLDSTEIN, *supra* note 6, § 2.2.1, at 63–64; MARSHALL LEAFFER, UNDERSTANDING COPYRIGHT LAW 58–59 (3d ed. 1999).

[67] CCC Info. Servs., Inc. v. Maclean Hunter Mkt. Reports, Inc., 44 F.3d 61, 65–66 (2d Cir. 1994).

hibit the creation of artistic work because it "would oblige each author to solicit the permission of her predecessors."[68]

There is also the view, articulated most famously by Justice Holmes, that "[i]t would be a dangerous undertaking for persons trained only to the law to constitute themselves final judges of the worth of pictorial illustrations, outside of the narrowest and most obvious limits."[69] The fear is that legal actors might deny protection to some valuable artistic contributions by employing their subjective or unrepresentative aesthetic judgments, at a loss both to society and the artists.[70] Amy Cohen builds on Justice Holmes's contention to argue that Congress implemented a minimal protectability threshold for copyright to avoid judgment on works' artistic value.[71] Jane Ginsburg complicates this Holmesian tale by arguing that there have historically been two de facto kinds of originality thresholds that must be recognized: one protecting the creative presence in high authorship works like novels and one protecting the sweat of the brow in low authorship works like telephone directories.[72] Nonetheless, the Constitution might require somewhat more than Justice Holmes's minimalist vision, as Diane Zimmerman suggests that *Feist* highlighted[73] by ruling that the Intellectual Property Clause's requirements of "Authors" and "Writings"[74] mandate the Court's understanding of copyright's originality requirement.[75]

Both of these justifications funnel into a conclusion that if society thinks an artistic work is valuable, it will bestow economic rewards on the

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[68] Jessica Litman, *The Public Domain*, 39 EMORY L.J. 965, 1023 (1990).

[69] Bleistein v. Donaldson Lithographing Co., 188 U.S. 239, 251 (1903). *See generally* Diane Leenheer Zimmerman, *The Story of* Bleistein v. Donaldson Lithographic Company*: Originality as a Vehicle for Copyright Inclusivity*, *in* INTELLECTUAL PROPERTY STORIES 77, 94–96 (Jane C. Ginsburg & Rochelle Cooper Dreyfuss eds., 2006) (recounting how Justice Holmes's unsuccessful attempt to stop the unauthorized reprinting of a famous book of his father's and his background making prints, sketches, and advertisements left him well-placed to state this view as applied to a circus's advertising posters).

[70] *Bleistein*, 188 U.S. at 251–52. *But see* Christine Haight Farley, *Judging Art*, 79 TUL. L. REV. 805, 839–57 (2005) (criticizing this view for masking the artistic judgments courts nonetheless make and for thinking that art cannot be judged and insisting instead that judges should explicitly borrow from the field of aesthetics to judge art when necessary); *cf.* Robert A. Gorman, *Copyright Courts and Aesthetic Judgments: Abuse or Necessity?*, 25 COLUM. J.L. & ARTS 1, 2 (2001) ("[I]t is quite common to find copyright courts assessing—sometimes covertly, other times openly—whether a work has merit, worth or social value.").

[71] 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, 179–81 (1990).

[72] Jane C. Ginsburg, *Creation and Commercial Value: Copyright Protection of Works of Information*, 90 COLUM. L. REV. 1865, 1870 (1990).

[73] Zimmerman, *supra* note 7, at 205–09.

[74] U.S. CONST. art. I, § 8, cl. 8 (granting Congress the power to promulgate laws "[t]o promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries").

[75] Feist Publ'ns, Inc. v. Rural Tel. Serv. Co., 499 U.S. 340, 346–48 (1991).

author via market forces, in which case the copyright has worth. Conversely, if society thinks a work lacks value, the copyright has no worth.[76]

C. *Explaining the Differences*

It is apparent from looking at the standards of protectability for patent and copyright law that it is much easier to secure a copyright than a patent. The question is why. This section catalogues the previously proffered explanations and suggests that a psychological explanation can help complete these other approaches.

One common explanation is that the differing standards of protectability in patent and copyright law make sense when one looks to the differing scopes of patent and copyright rights. Dale Olson, one proponent of this view, states that "[c]opyright is a severely limited form of protection," in that any independently created work—even if identical—cannot infringe a copyright, while "[t]he patent owner is granted the right to exclude others from practicing the patented invention even if independently discovered."[77] Therefore, Olson continues, we ought to feel comfortable with many works qualifying for copyright, because the development of culture can still proceed apace with the possibility of independent creation. In contrast, the broad patent right justifies stricter protectability requirements to promote scientific progress.[78]

This explanation is not satisfying on its own. It would seem that proponents of this view would be just as happy if it were easier to get a patent so long as the patent right were weaker, or if it were harder to get a copyright so long as the copyright were stronger.[79] Without an additional justification, this view does not answer why copyright and patent look so different in terms of their protectability thresholds.[80]

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[76] Lichtman, *supra* note 65, at 700–01.

[77] Olson, *supra* note 6, at 34. Clarisa Long has attempted to explain why this difference in independent creation exists in terms of information costs, *see* Long, *supra* note 6, which I have questioned in previous work, Fromer, *supra* note 2, at 754–55.

[78] *See* Olson, *supra* note 6, at 34 ("The limited nature of copyright protection . . . requires an emphatic rejection of any comparison with patents, either in the standards to be applied in protecting works in which copyright is claimed or in identifying the parameters of copyright protection. . . . As a consequence, the requirements for granting patents are concomitantly higher than the standards for copyright protection." (footnote omitted)); *accord* Duffy, *supra* note 20, at 9–10.

[79] *Cf.* Ted O'Donoghue, Suzanne Scotchmer & Jacques-François Thisse, *Patent Breadth, Patent Life, and the Pace of Technological Progress*, 7 J. ECON. & MGMT. STRATEGY 1, 4 (1998) ("A specified rate of innovation can be achieved with either (1) a patent of infinite length and modest leading breadth, or (2) a patent with infinite leading breadth and modest length. The former is more efficient in minimizing R&D costs, but the latter is more efficient in minimizing the costs of delayed diffusion.").

[80] One possibility, as suggested by David Friedman, is that "[c]opyright protection against literal copying creates a form of property that is easy to define, cheap to enforce, relatively easy to transact over, and subject to no rent-seeking problem. Hence we give copyright easily and for a long term. Patent protection creates a form of property that is hard to define, hard to enforce, costly to transact over, and contains a potential inefficiency due to patent races leading to duplication and inefficiently early

If the basis of the minimal originality requirement is to create a vast cultural library, why is the standard for patent protection not also equally minimal to encourage vast amounts of scientific and engineering innovation? Paul Goldstein suggests, in a results theory, that the goals underlying copyright and patent law are different in this regard. He proposes that "[t]he aim of copyright law is to direct investment toward the production of abundant information, while the aim of patent law is to direct investment toward the production of efficient information."[81] Goldstein reasons that the easily satisfied standard of originality in copyright law leads to the creation of plenty of artistic works.[82] He contrasts that with patent law's stricter requirements of novelty, nonobviousness, utility, and disclosure, which channel innovators' energies to create the most effective scientific and engineering inventions.[83] Goldstein's theory makes sense and explains the demand side of intellectual property. As discussed in the next two parts, however, I present a complementary and previously undertheorized story of the supply side of intellectual property, which suggests that Goldstein's theory accords with important differences between the prototypical creative processes for copyrightable and patentable works.

In a third explanation, Clarisa Long suggests a judgment theory, which bases the differences in patent and copyright standards on the fact that an invention's characteristics are ascertainable objectively, while artistic works' characteristics lie in the eye of the beholder.[84] Because artistic works cannot be judged in any objective fashion, copyright law imposes a subjective standard of originality. By contrast, scientific works can be assessed on objective criteria, meriting patent law's objective standards of novelty, nonobviousness, and utility.[85] Although it is commonplace to think that people can objectively judge science but not art, empirical data and some strands of philosophical thought partially belie this notion. Studies show that people—lay or expert—agree in their judgments of art, music, and literature just as much as they agree about the merit of a scientific article or a medical diagnosis.[86] Moreover, a respected line of philosophical thought suggests that choosing which scientific theories and approaches to

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inventions. Hence we give patents grudgingly and for a short term." DAVID D. FRIEDMAN, LAW'S ORDER: WHAT ECONOMICS HAS TO DO WITH LAW AND WHY IT MATTERS 135–36 (2000). In previous work, I question whether it is easier to define the set of works protected by a particular copyright than those protected by a particular patent and thus whether it is easier to transact over copyrights than patents. Fromer, *supra* note 2, at 781–94.

[81] 1 GOLDSTEIN, *supra* note 6, § 2.2.1, at 64.

[82] *Id.*

[83] *Id.*

[84] Long, *supra* note 6, at 469–70, 487–89.

[85] Cohen, *supra* note 71, at 179–80; Note, *Protecting the Artistic Aspects of Articles of Utility: Copyright or Design Patent?*, 66 HARV. L. REV. 877, 885 (1953).

[86] Colin Martindale, *Art and Artists*, *in* 1 ENCYCLOPEDIA OF CREATIVITY 115, 118 (Mark A. Runco & Steven R. Pritzker eds., 1999) ("[P]air-wise agreement is around .20–.30 . . . .").

follow is in good measure a subjective enterprise.[87] According to the psychological explanation of creativity in the arts and sciences, which I explore in the next Part, art is often subjective and inventive activity is often objective. This distinction has more to do with the notion that art is personally grounded while science is less so[88] than with the notion that people cannot judge art using objective criteria but can so judge science. A psychological explanation,[89] then, might complement the judgment theory by explaining why people do not want to judge art but are comfortable judging science, even though they can frequently do both equally well.

Paul Goldstein suggests a related fourth reason for the different standards: an indexing theory. He claims that "unlike technological advances, which can be classified and indexed to facilitate efficient searches of the prior art, literary, musical and artistic expression cannot be effectively classified to enable authors, composers and artists to examine all pertinent prior works to determine whether their contributions substantially differ from these prior works."[90] On this reasoning, then, copyright law must have a minimal standard of originality because creators under copyright's rubric cannot easily ensure that their works are distinct from preceding ones, as patent law can, thereby allowing stricter standards of novelty and nonobviousness to govern.[91] A psychological theory of intellectual property complements the indexing theory by suggesting why society would not want to index art but is comfortable indexing scientific and technological invention.[92]

John Wiley offers a fifth explanation: a learning theory. He hypothesizes that patent law requires novelty and nonobviousness because of the imperative for scientists and engineers to learn what has come before

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[87] *E.g.*, Thomas S. Kuhn, *Objectivity, Value Judgment, and Theory Choice*, *in* THE ESSENTIAL TENSION: SELECTED STUDIES IN SCIENTIFIC TRADITION AND CHANGE 320 (1977) (theorizing that subjective decisions as to which scientific theory ought to dominate must typically be made once one objectively—based on characteristics like accuracy, consistency, and simplicity—narrows down the field to a small number of good scientific theories).

[88] *E.g.*, Dean Keith Simonton, *Varieties of Perspectives on Creativity*, 4 PERSP. ON PSYCHOL. SCI. 466, 466–67 (2009) ("[N]atural scientists were far more likely to view objectivity (a) as intrinsic to the research process rather than as contingent on the investigator's impartiality or nonsubjectivity and (b) as actually attainable and attained in scientific practice rather than as being doubtful, impossible, or nonexistent."). This theory differentiating between art as feeling and science as coldly rational is most often situated in the Enlightenment. Robert S. Albert & Mark A. Runco, *A History of Research on Creativity*, *in* HANDBOOK OF CREATIVITY 16, 23 (Robert J. Sternberg ed., 1999).

[89] *See, e.g.*, *infra* Part III.

[90] 1 GOLDSTEIN, *supra* note 6, § 2.2.1, at 64 n.8.

[91] In prior work, I explore whether copyrighted works might be claimed more like patented works, alleviating this difficulty. Fromer, *supra* note 2, at 781–94.

[92] Despite patent law's indexing of inventions, however, the database of patent documents is hard to search through to find relevant inventions due to systematic deficiencies in patent law. Fromer, *supra* note 23, at 585–87. For a discussion of a psychological theory of intellectual property, see *infra* Part III.

them.[93] Patent law requires inventors to review what others in the domain have already accomplished, thereby producing the opportunity for the inventor to learn from and build upon the prior art and create something sufficiently different.[94] According to Wiley, this encouraged process of innovation accords with the notion that scientific and technological innovation is cumulative.[95] Wiley thinks copyright is different. He indicates that "[i]t is conventionally desirable for composers to know the literature, but a judge would seem brazen to assert that excavating musical artifacts was the most efficient way to compose new music."[96] Therefore, there is no requirement in copyright law that an artist ensure that his creation is novel before qualifying for copyright protection. As psychological studies show,[97] what Wiley terms his "seat-of-the-pants intuition"[98] is not entirely correct. Creativity in both art and science frequently requires significant knowledge of that which came before.[99]

Much rings true about the results, judgment, and indexing theories' explanations of why the protectability standards for copyright and patent are so different. In showing how a psychological account of creativity accords with the distinct protectability standards in intellectual property, this Article makes explicit a hidden foundation upon which the existing theories rest. As such, this Article now turns to the psychological processes by which artists and scientists create and by which individuals enjoy creative works.

II. CREATIVITY

This Part elucidates the psychological literature on scientific and artistic creativity, highlighting key differences between the two. Section A makes the case that intellectual property law ought to care about the psychological process of creativity in the arts and sciences. Section B then describes the psychological literature on creativity, first generally and then as it manifests in varying ways in the scientific and artistic domains.

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[93] Wiley, *supra* note 6, at 146.

[94] *Id.*; *cf.* Karjala, *supra* note 10, at 449 (emphasizing "the social desirability of allowing later creators of functional works to build on and improve what has come before").

[95] Wiley, *supra* note 6, at 146.

[96] *Id.* at 147.

[97] *See infra* Part II.

[98] Wiley, *supra* note 6, at 147.

[99] *See infra* text accompanying notes 124–28. Glynn Lunney suggests a sixth explanation, based on ease of copying. He suggests that it is typically much easier to copy the creativity in an artistic work—say, a book or a song—than in an invention—say, a car design. Glynn S. Lunney, Jr., Lotus v. Borland*: Copyright and Computer Programs*, 70 TUL. L. REV. 2397, 2428 (1996). Therefore, Lunney continues, copyright ought to be made more easily available than patent. *Id.* at 2428–29.

A. Why the Creative Process Matters

A number of different theories have been offered to justify intellectual property laws.[100] For patent and copyright, there is the utilitarian theory that intellectual property rights produce an incentive to create work that is valuable to society. For both forms of intellectual property, there is also the Lockean notion that creators deserve a reward for their labor. And for copyright, there is the Hegelian idea that authors deserve copyright for putting their personalities into their work.

These distinct theories have a common thread: they are all concerned with the process by which artists, scientists, and engineers create.[101] The utilitarian theory seeks to provide people with the incentive to act creatively, thereby producing something of value to society. The labor theory aims to provide a reward to people who have produced a work through the often arduous[102] creative process. One understanding of the Hegelian moral rights theory is that it is the creative process itself that captures the author's personality and implants it into the resulting work.[103] Because each theory cares centrally about the creative process,[104] it is crucial to explore the psychology of creativity to learn how creativity works and how the stimulation of creativity relates to and ought to influence intellectual property laws.[105]

Despite the relevance of the creative process to intellectual property in each of these theories of intellectual property, one might come to a different conclusion about the applicability of psychological research on creativity depending on one's preferred theory. A utilitarian likely would be con-

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[100] *See* discussion *supra* Part I.C.

[101] *Cf.* John C. Huber, *Invention and Inventivity Is a Random, Poisson Process: A Potential Guide to Analysis of General Creativity*, 11 CREATIVITY RES. J. 231, 232 (1998) ("Some commonly accepted definitions of creativity closely parallel those of patents, with the patent definition being somewhat more specific and restrictive.").

[102] *See infra* text accompanying notes 134–38.

[103] *Cf.* Justin Hughes, *The Personality Interest of Artists and Inventors in Intellectual Property*, 16 CARDOZO ARTS & ENT. L.J. 81, 82 (1998) (hypothesizing that present in any piece of intellectual property are three personality interests: creativity, intentionality, and identification as the source of the intellectual property). Keith Sawyer theorizes that individualist cultures like the United States exaggerate the individual's role in creativity and underplay society's role. R. KEITH SAWYER, EXPLAINING CREATIVITY: THE SCIENCE OF HUMAN INNOVATION 147–49 (2006); *see also infra* text accompanying notes 114–19 (defining creativity as having individual and sociocultural components).

[104] *Cf.* Jane C. Ginsburg, *The Concept of Authorship in Comparative Copyright Law*, 52 DEPAUL L. REV. 1063, 1068 (2003) (arguing that copyright scholarship should center its focus on authors to foster creativity).

[105] There was no systemic study of the psychology of creativity until relatively recently. Psychologists attribute this lack of study to the mystical quality many attribute to creativity, of divine—or at least inexplicable—interventions, filling people with inspiration and making them an unsuitable object of scientific inquiry. Scott G. Isaksen & Mary C. Murdock, *The Emergence of a Discipline: Issues and Approaches to the Study of Creativity*, *in* UNDERSTANDING AND RECOGNIZING CREATIVITY: THE EMERGENCE OF A DISCIPLINE 13, 25–27 (Scott G. Isaksen, Mary C. Murdock, Roger L. Firestein & Donald J. Treffinger eds., 1993); Robert J. Sternberg & Todd I. Lubart, *The Concept of Creativity: Prospects and Paradigms*, *in* HANDBOOK OF CREATIVITY, *supra* note 88, at 3, 4–5.

cerned primarily with structuring intellectual property laws to reward people who have undertaken the creative process. By contrast, a Lockean might prefer to provide greater reward to those forms or exercises of creativity that are more labor intensive, because they require either more schooling and acquisition of domain knowledge as a prerequisite to creativity in that domain[106] or more invested time and energy from the start to finish of the creative process.[107] And a Hegelian would probably want greater compensation to be directed at those inventors and artists whose creative processes cause them to inject more of their personalities into their resulting products.

Although each of these diverse approaches provides a viable underpinning for applying psychological research on creativity to intellectual property, in this Article I ground the application of the creativity research to intellectual property in utilitarianism. I concentrate on utilitarianism for two reasons. First, utilitarianism is the prevailing approach to understanding intellectual property in the United States[108] because of the constitutional language enabling Congress to enact copyright and patent laws in the first instance.[109] Second, utilitarianism as a basis allows for the most direct application of creativity research to intellectual property. Utilitarianism is concerned with giving people incentives to make creative products and thus rewarding people for navigating and completing the creative process. Applying the psychological research on creativity, then, to intellectual property is simply about trying to reward artistic creativity in copyright law and scientific and engineering creativity in patent law.

There is an additional advantage to analyzing the appropriate form and extent of intellectual property protection through the lens of the psychology of creativity, particularly when adhering to the utilitarian approach. Existing legal and economic scholarship acknowledges the difficulty, if not impossibility, of empirically testing whether particular patent laws encourage innovation in the sciences and engineering and whether particular copyright laws do the same in the arts.[110] Accurately measuring whether the right of exclusivity created by intellectual property laws produces an incentive to

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[106] *See infra* text accompanying notes 124–28.

[107] *See infra* text accompanying notes 136–37.

[108] *E.g.*, ROBERT P. MERGES, PETER S. MENELL & MARK A. LEMLEY, INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE 10–11 (rev. 4th ed. 2007); Yochai Benkler, *Siren Songs and Amish Children: Autonomy, Information, and Law*, 76 N.Y.U. L. REV. 23, 59 (2001).

[109] *See* U.S. CONST. art. I, § 8, cl. 8 (granting to Congress the power "[t]o promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries").

[110] *E.g.*, Christina Bohannon, *Copyright Harm, Foreseeability, and Fair Use*, 85 WASH. U. L. REV. 969, 988 (2007); Mark A. Lemley, *Reconceiving Patents in the Age of Venture Capital*, 4 J. SMALL & EMERGING BUS. L. 137, 139 (2000); Keith E. Maskus, *Intellectual Property Rights and Economic Development*, 32 CASE W. RES. J. INT'L L. 471, 494–95 (2000); George L. Priest, *What Economists Can Tell Lawyers About Intellectual Property*, 8 RES. L. & ECON. 19, 19–20 (1986).

create valuable works in the arts, sciences, and engineering is difficult because innovation differs by industry, by firm size, and by firm model.[111] The number of variables necessary to measure the effectiveness of intellectual property laws simply cannot easily be held constant to produce reliable evidence. Studying how creativity works in the arts and sciences provides a way to bypass this clogged passage in intellectual property scholarship. By examining creativity, the activity that copyright and patent law each seek to stimulate, instead of examining the economic impact of these laws, we can begin to understand better how to structure these laws to induce valuable creativity.

B. The Psychology of Creativity

This section explores two aspects of psychological research on creativity: first, the process by which creators create and, second, the process by which individual audience members decide which created works are valuable. In so doing, the section first delves into the general components of creativity and then shows how creativity differs in scientific and artistic domains. Creativity involves finding—or formulating and constraining—a problem, followed by solving the problem. In essence, problem solving is key to creativity in the scientific and engineering domains, particularly where invention is concerned, while artistic creativity emphasizes problem finding. Moreover, society typically can tolerate large degrees of newness in inventions resulting from scientific creativity, while it usually prefers having some, but not too much, newness in products resulting from artistic creativity.[112] These differences principally accord with the different thresholds for protectability in patent and copyright laws.[113]

1. The Components of Creativity.—Although there are varying colloquial understandings of creativity,[114] the field of psychology consistently defines creativity as a process that generates a product or idea and possesses two qualities: newness and appropriateness[115]—appropriate in the sense that

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[111] Lemley, *supra* note 110, at 139.

[112] A caveat must be given that the typology of the creative process described herein portrays creativity as psychologists understand it based on their research. The domains in which these psychologists test the parameters and process of creativity tend to be the ones that American culture accepts as mainstream forms of creativity. Therefore, the creativity involved in less frequently tested domains, such as outsider art (like graffiti), might or might not be captured by these studies.

[113] *See* discussion *infra* Part III.A–B.

[114] The term *creativity* came into common usage only after World War II. ROBERT PAUL WEINER, CREATIVITY & BEYOND: CULTURES, VALUES, AND CHANGE 5 (2000). Although its etymological root, *create* (derived from the Latin *creatio* or *creatus*), was in long use, the noun "creativity" was first used in the late nineteenth century as people sought a term to represent a common quality that transcends the specific artistic and scientific domains. *Id.* at 8, 89 (reciting the first usage by Adolfus William Ward in his *History of Dramatic English Literature* to describe Shakespeare's "poetic creativity").

[115] *E.g.*, MIHALY CSIKSZENTMIHALYI, CREATIVITY: FLOW AND THE PSYCHOLOGY OF DISCOVERY AND INVENTION 25, 28–29 (1996) (defining creativity as a novel product that is accepted into a domain); SAWYER, *supra* note 103, at 27 (understanding creativity to involve both novelty and social value to

some community recognizes it as socially valuable.[116] While the creative process is essentially psychological,[117] the element of appropriateness can be evaluated only in a sociocultural context.[118] As Keith Sawyer, a scholar of creativity, explains, "Individual-level explanations are the most important component of the explanation of creativity . . . . But individuals always create in contexts, and a better understanding of those contexts is essential to a complete explanation of creativity."[119] Assessing creativity is not complete without reference to a work's effect on the relevant culture and its social judgments.[120] According to the influential theory of Mihaly Csikszentmihalyi, creativity can be appraised only at the intersection of individuals, the domain in which they are working, and the field (the do-

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some community); Howard E. Gruber & Doris B. Wallace, *The Case Study Method and Evolving Systems Approach for Understanding Unique Creative People at Work*, *in* HANDBOOK OF CREATIVITY, *supra* note 88, at 93, 94 ("Like most definitions of creativity, ours includes novelty and value: The creative product must be new and must be given value according to some external criteria."); Sternberg & Lubart, *supra* note 105, at 3 (defining creativity as "the ability to produce work that is both novel (i.e., original, unexpected) and appropriate (i.e., useful, adaptive concerning task constraints)").

[116] Innovation is given varied meanings in the psychological literature. One definition distinguishes it from creativity by suggesting that creativity "is driven by intrinsic motives, whereas [innovation] is driven by extrinsic incentives and 'the need to surpass previous standards.'" MARK A. RUNCO, CREATIVITY: THEORIES AND THEMES: RESEARCH, DEVELOPMENT, AND PRACTICE 382 (2007). Thus, effectiveness is more important to innovation than newness, although newness is a necessary ingredient. *Id.* at 383. Another definition suggests that innovation is how a firm profits from creativity. JAMES M. HIGGINS, INNOVATE OR EVAPORATE: TEST AND IMPROVE YOUR ORGANIZATION'S IQ: ITS INNOVATIONS QUOTIENT 9 (1995).

[117] Personality studies demonstrate that certain characteristics are common to the creative person: independent judgment, self-confidence, risk taking, and interest in complexity and aesthetics. Robert J. Sternberg, *A Three-Facet Model of Creativity*, *in* THE NATURE OF CREATIVITY: CONTEMPORARY PSYCHOLOGICAL PERSPECTIVES 125, 128 (Robert J. Sternberg ed., 1988); Sternberg & Lubart, *supra* note 105, at 8 (citing F. Barron & D.M. Harrington, *Creativity, Intelligence, and Personality*, 32 ANN. REV. PSYCHOL. 439 (1981)). There are differences, though, between the personality profiles of the artist and the scientist. For artists, the interest in aesthetics is higher, while interest in theories is higher for scientists. JACOB W. GETZELS & MIHALY CSIKSZENTMIHALYI, THE CREATIVE VISION: A LONGITUDINAL STUDY OF PROBLEM FINDING IN ART 34, 254 fig.A1.1 (1976); Albert N. Katz, *Creative Styles: Relating Tests of Creativity to the Work Patterns of Scientists*, 5 PERSONALITY & INDIVIDUAL DIFFERENCES 281, 281 (1984). *But cf.* Anne Roe, *The Psychology of the Scientist*, 134 SCIENCE 456, 456 (1961) (emphasizing that scientists are not devoid of emotion, as many expect, compared with artists).

[118] SAWYER, *supra* note 103, at 27, 122.

[119] *Id.* at 113.

[120] *See* CSIKSZENTMIHALYI, *supra* note 115, at 6; Mihaly Csikszentmihalyi, *Implications of a Systems Perspective for the Study of Creativity*, *in* HANDBOOK OF CREATIVITY, *supra* note 88, at 313, 313–14; Joseph Kasof, *Explaining Creativity: The Attributional Perspective*, 8 CREATIVITY RES. J. 311, 313 (1995). Of course, work might challenge social judgments as well, but as Mihaly Csikszentmihalyi puts it, "Just as the sound of a tree crashing in the forest is unheard if nobody is there to hear it, so creative ideas vanish unless there is a receptive audience to record and implement them." CSIKSZENTMIHALYI, *supra* note 115, at 6. That is, there must be acceptance by some—sometimes tiny or unconventional—segment of society for the work to have any effect.

main's gatekeepers).[121] In a sense, the sociopsychological definition of creativity looks similar to intellectual property's aim of giving protection for products that are requisitely new, while leaving to society the question of how valuable the product ought to be considered.[122] From this framework flows the notion that the typical audience for various creative products might be different: it might be as broad as all of society—such as when it evaluates the worth of the latest popular song or mobile telephone—or as specialized as an elite handful of physicists appraising a new theory or art critics assessing avant-garde artwork.[123]

Creativity courses through so many different domains, from the arts—prototypically literature, music, and fine art—to theoretical and applied sciences—exemplified by physics, chemistry, biology, and engineering—to everyday activities—whether writing in a journal or figuring out an ingenious way to attain an object beyond one's reach. People considered to be highly creative are typically so in just one domain, especially because "it takes a lot of experience, knowledge, and training to be able to identify good problems" and solve them.[124] Particularly with regard to activities in the prototypical arts and sciences, creativity depends on internalizing knowledge about the relevant domain, frequently through formal schooling,[125] a decade or thereabouts of learning the domain,[126] and gaining access to the field.[127] This development of domain expertise is critical, as one cannot typ-

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[121] *See* CSIKSZENTMIHALYI, *supra* note 115, at 6, 27–30 (discussing how "[f]ields vary greatly in terms of how specialized versus how inclusive they are").

[122] Interestingly enough, research on creativity demonstrates the possibility that an external reward undermines creativity, SAWYER, *supra* note 103, at 53, which would seem to cast a negative light on intellectual property protection. But any negative effect of a reward is absent when the reward depends on the work's quality or when the reward is available continually. Robert Eisenberger & Judy Cameron, *Detrimental Effects of Reward: Reality or Myth?*, 51 AM. PSYCHOLOGIST 1153, 1162–64 (1996). The value of intellectual property protection depends in large part on the protected work's quality and is continuously available. As such, it ought not to undermine creativity.

[123] CSIKSZENTMIHALYI, *supra* note 115, at 43.

[124] SAWYER, *supra* note 103, at 47, 210; *accord* CSIKSZENTMIHALYI, *supra* note 115, at 29, 47 (applying this principle to the arts and sciences). Related is the theory that there are multiple types of intelligence. *See generally* HOWARD GARDNER, FRAMES OF MIND: THE THEORY OF MULTIPLE INTELLIGENCES (2d ed. 1993) (defining seven types of intelligence: linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, internal personal, and outward personal). Pertinently, those high in linguistic intelligence tend to be good writers or speakers, *id.* at 73–98; in musical intelligence tend to be musical composers or performers, *id.* at 99–127; in logical-mathematical intelligence often are mathematicians or scientists, *id.* at 128–69; in spatial intelligence can do well as scientists, inventors, sculptors, or painters, *id.* at 170–204; in bodily-kinesthetic intelligence tend to be good dancers, swimmers, artisans, athletes, instrumentalists, inventors, or actors, *id.* at 205–36; and in the personal intelligences tend to have access to their range of emotions and characteristics if internal, and to be good at discerning others' moods and intentions if outward, *id.* at 237–76.

[125] SAWYER, *supra* note 103, at 21, 60.

[126] *E.g.*, K. Anders Ericsson, *The Acquisition of Expert Performance: An Introduction to Some of the Issues*, *in* THE ROAD TO EXCELLENCE: EMPIRICAL EVIDENCE FROM THE ARTS AND SCIENCES, SPORTS, AND GAMES 1 (K. Anders Ericsson ed., 1996).

[127] CSIKSZENTMIHALYI, *supra* note 115, at 54–55.

ically appreciate or convey newness in a work without reference to the domain's preexisting works.[128] When this appreciation or communication is less necessary—as in creative acts in everyday life or occasionally in the arts and sciences—training in the relevant domain is not as critical. In any event, certain aspects of creativity, including the steps of the creative process, are thought to be independent of the domain in which it is exercised.[129] Some features of creativity, such as the ability to make connections between remote concepts[130] (like Johannes Gutenberg's association of a book printing apparatus with the pressing of grapes to make wine to create the printing press[131]), are domain general,[132] while the knowledge needed to forge those connections is domain specific.[133]

Contrary to popular images of serendipitous discoveries in the sciences and instantaneous aesthetic breakthroughs, creativity is hard work.[134] Beyond the decade or so of acquiring the necessary domain expertise to be creative in many domains,[135] being creative requires much internal motivation to move through the often lengthy process of producing a creative work.[136] Creative work typically is not produced in the time that it takes

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[128] Csikszentmihalyi, *supra* note 120, at 315 ("Without rules there cannot be exceptions, and without tradition there cannot be novelty."); Thomas S. Kuhn, *The Essential Tension: Tradition and Innovation in Scientific Research*, *in* SCIENTIFIC CREATIVITY: ITS RECOGNITION AND DEVELOPMENT 341, 342 (Calvin W. Taylor & Frank Barron eds., 1963); Thomas B. Ward, Steven M. Smith & Jyotsna Vaid, *Conceptual Structures and Processes in Creative Thought*, *in* CREATIVE THOUGHT: AN INVESTIGATION OF CONCEPTUAL STRUCTURES AND PROCESSES 1, 19 (Thomas B. Ward, Steven M. Smith & Jyotsna Vaid eds., 1997).

[129] *E.g.*, Colin Martindale, *Biological Bases of Creativity*, *in* HANDBOOK OF CREATIVITY, *supra* note 88, at 137, 137.

[130] *See infra* text accompanying notes 148–56.

[131] *See infra* text accompanying note 153.

[132] Teresa M. Amabile, *Within You, Without You: The Social Psychology of Creativity, and Beyond*, *in* THEORIES OF CREATIVITY 61, 66–67 (Mark A. Runco & Robert S. Albert eds., 1990).

[133] Mihaly Csikszentmihalyi, *The Domain of Creativity*, *in* THEORIES OF CREATIVITY, *supra* note 132, at 190, 190; Sternberg, *supra* note 105, at 12. *But see* Jonathan A. Plucker, *Beware of Simple Conclusions: The Case for Content Generality of Creativity*, 11 CREATIVITY RES. J. 179, 179–80 (1998) ("[T]he rush to characterize creativity as content specific is based upon particularly selective interpretations of theory, research with significant methodological limitations, and circuitous logic . . . .").

[134] *See* DEAN KEITH SIMONTON, SCIENTIFIC GENIUS: A PSYCHOLOGY OF SCIENCE 56 (1988) ("On the motivational side, the notable researcher exhibits a profound enthusiasm for scientific work, quite willingly assigning considerable time to that endeavor, even to the point of relinquishing the usual interest in social activities."); Gruber & Wallace, *supra* note 115, at 94 (emphasizing purposeful behavior as an integral aspect of creativity).

[135] *See supra* text accompanying note 126.

[136] CSIKSZENTMIHALYI, *supra* note 115, at 185; J.A. Chambers, *Relating Personality and Biographical Factors to Scientific Creativity*, 78 PSYCHOL. MONOGRAPHS: GEN. & APPLIED 1, 6 (1964); Sternberg & Lubart, *supra* note 105, at 10–11 (indicating that valuing a person's creative activities drives him or her to produce more creative works).

lightning to strike but rather on the order of months, years, and decades.[137] In fact, many well-known stories of spontaneously fortuitous creations are false. For instance, despite the legend that the poem *Kubla Khan* came all at once to Samuel Taylor Coleridge in an opium-induced dream, many of the author's prior readings and writings that became components of the finished poem provide ample evidence that this fable is untrue.[138] Creativity, as understood by psychologists, is something people deliberately cultivate in their respective domains.

Psychological scholarship indicates that there are four stages to the creative process: preparation, incubation, illumination, and verification.[139] Although these stages occur in sequential order in the prototypical case, psychologists think that these ought not to be viewed as stages that necessarily occur in a precise order and just once per creative process.[140] The preparation stage consists of finding a problem and gathering necessary information.[141] A problem "can be defined as a situation with a goal and an obstacle. The individual wants or needs something (the goal) but must first deal with the obstacle."[142] Problem finding, then, comprises one or more of the following related activities: "problem construction, problem identification (where a task is simply recognized but not manipulated or operationalized), problem definition (where the task is prepared for solution), problem discovery, problem perception, and problem generation."[143] For example, as a crucial step toward creating a printing press, Gutenberg identified the problem of a machine to transfer images onto a medium, such as paper.[144] Or as a critical step toward creating his painting *Guernica*, Pablo Picasso identified as his theme the destruction caused by bombing during the Spanish Civil War in the town of Guernica.[145] A person with vast knowledge about a domain can recognize when new views or data do not fit into the

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[137] Howard E. Gruber & Sara N. Davis, *Inching Our Way up Mount Olympus: The Evolving-Systems Approach to Creative Thinking*, *in* THE NATURE OF CREATIVITY: CONTEMPORARY PSYCHOLOGICAL PERSPECTIVES, *supra* note 117, at 243, 265.

[138] D.N. Perkins, *The Possibility of Invention*, *in* THE NATURE OF CREATIVITY: CONTEMPORARY PSYCHOLOGICAL PERSPECTIVES, *supra* note 117, at 362, 363.

[139] *E.g.*, CSIKSZENTMIHALYI, *supra* note 115, at 79–80 (grouping these same activities into five stages: preparation, incubation, insight, evaluation, and elaboration); RUNCO, *supra* note 116, at 19; SAWYER, *supra* note 103, at 58–59.

[140] CSIKSZENTMIHALYI, *supra* note 115, at 80 ("[T]he creative process is less linear than recursive."); RUNCO, *supra* note 116, at 30–31; SAWYER, *supra* note 103, at 70–71 (elaborating that, throughout the creative process, "the creator experiences frequent but small mini-insights").

[141] RUNCO, *supra* note 116, at 19; SAWYER, *supra* note 103, at 58.

[142] RUNCO, *supra* note 116, at 14.

[143] *Id.* at 16.

[144] *See generally* ELIZABETH L. EISENSTEIN, THE PRINTING PRESS AS AN AGENT OF CHANGE (1980) (recounting the printing press's invention and its impact on society).

[145] *See generally* GIJS VAN HENSBERGEN, *GUERNICA*: THE BIOGRAPHY OF A TWENTIETH-CENTURY ICON (2004) (describing the painting's origin and analyzing its many different meanings to the world).

person's extensive cognitive framework for that domain.[146] A knowledgeable person therefore has the ability to find valuable problems to solve in a way that a more ignorant person typically will not.[147] Once the problem is prepared, the next steps in the creativity process move the problem past its obstacles and toward a solution.

Incubation, the next stage, is an underrecognized stage of the creative process and concerns the unconscious processing of information to solve the prepared problem.[148] Although we are unaware of it, our minds are at work processing data and making associations, perhaps remote and random ones, plodding toward a solution to an identified problem, often when we are idle.[149] The mind is essentially thought to be working over the knowledge that is specific to the problem's domain and drawing analogies to other domains or within the domain.[150] As Kevin Dunbar explains, "small mutations in concepts occur due to analogy and other reasoning mechanisms," leading to "major changes in a concept."[151] The incremental nature of conceptual development provides an explanation for why it is so hard to pin down what happens during incubation.[152] It is during this stage, for instance, that Gutenberg's mind was drawing connections between the pressing of grapes to make wine and the pressing of paper to affix images or type[153] and Picasso was figuring out imagery that would represent his theme

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[146] Steven M. Hoover & John F. Feldhusen, *Scientific Problem Solving and Problem Finding: A Theoretical Model*, *in* PROBLEM FINDING, PROBLEM SOLVING, AND CREATIVITY 201, 213 (Mark A. Runco ed., 1994).

[147] *See id.*

[148] RUNCO, *supra* note 116, at 19; SAWYER, *supra* note 103, at 58.

[149] CSIKSZENTMIHALYI, *supra* note 115, at 101–03; RUNCO, *supra* note 116, at 19–20; SAWYER, *supra* note 103, at 62. *See generally* Richard E. Mayer, *The Search for Insight: Grappling with Gestalt Psychology's Unanswered Questions*, *in* THE NATURE OF INSIGHT 3, 3 (Robert J. Sternberg & Janet E. Davidson eds., 1996) (describing different possible ways—schema completion, reorganization of visual information, reformulation of a problem, overcoming of a mental block, or analogy—for insight to develop).

[150] RUNCO, *supra* note 116, at 12, 26; SAWYER, *supra* note 103, at 62–65. Research relatedly shows that people who are in or can induce a state of psychological distance—experiencing things as apart from their here and now—are more likely to produce creative solutions. Oren Shapira & Nira Liberman, *An Easy Way to Increase Creativity*, SCI. AM. (July 21, 2009), http://www.scientificamerican.com/article.cfm?id=an-easy-way-to-increase-c.

[151] Kevin Dunbar, *How Scientists Think: On-Line Creativity and Conceptual Change in Science*, *in* CREATIVE THOUGHT: AN INVESTIGATION OF CONCEPTUAL STRUCTURES AND PROCESSES, *supra* note 128, at 488; *accord* Frederic L. Holmes, *Antoine Lavoisier and Hans Krebs: Two Styles of Scientific Creativity*, *in* CREATIVE PEOPLE AT WORK: TWELVE COGNITIVE CASE STUDIES 44, 51–55, 58–61 (Doris B. Wallace & Howard E. Gruber eds., 1989) (elaborating how Antoine Lavoisier came up with his theory of respiration based on two incomplete ideas developing into a crisper one and similarly how Hans Krebs discovered the first metabolic cycle).

[152] Dunbar, *supra* note 151, at 488 ("The many incremental steps that are involved in creative cognition are often lost and forgotten, and the act of creation becomes a mythical entity in which the final step in the creative process is often seen as the cause of the new concept.").

[153] SIMONTON, *supra* note 134, at 34–35.

of war's destruction in Guernica.[154] Experts have the advantage of having "develop[ed] huge knowledge bases, much of it domain-specific knowledge, but at least as important is that they have a larger number of interconnections among their knowledge," which is well organized.[155] Experts have the disadvantage, however, of making assumptions because they know so much, which might prevent them from reasoning toward a problem solution or making a helpful analogy (or at the least lengthen the incubation period).[156]

The third stage, illumination, is the one most popularly associated with creativity. It is the "a-ha" moment of insight.[157] As with the proverbial light bulb going off above one's head, illumination of a solution to the identified problem seems to occur suddenly and consciously.[158] It is theorized, however, that illumination only feels sudden because the preceding incubation is inaccessible to consciousness.[159]

The fourth stage, verification, is the part of the creative process during which a person tests ideas and fully develops them.[160] As part of verification, the person must be able to judge whether the idea is worth pursuing further[161] and, if so, continue to refine the idea. As Keith Sawyer explains, "Once you start executing an idea, you often realize that it isn't working out like you expected, and you have to change what you had in mind."[162] At this stage, people consciously draw on their domain expertise to turn something from an idea into a product.[163]

Psychologists studying creativity emphasize that key aspects of these four stages of creativity are problem finding and problem solving.[164] Problem finding is typically associated with preparation, and problem solving

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[154] *Cf.* RUDOLF ARNHEIM, THE GENESIS OF A PAINTING: PICASSO'S *GUERNICA* (2d ed. 2006) (presenting Picasso's sketches that ultimately resulted in *Guernica*).

[155] RUNCO, *supra* note 116, at 26.

[156] *Id.*

[157] SAWYER, *supra* note 103, at 59.

[158] RUNCO, *supra* note 116, at 20; SIMONTON, *supra* note 134, at 31.

[159] RUNCO, *supra* note 116, at 21. As support for this theory, psychologists point to the semantic similarity between guesses and answers, in that "automatic cognitive processes generate a graded approach to solving problems even when a solution seems to surface discontinuously as a sudden insight." Kenneth S. Bowers, Peter Farvolden & Lambros Mermigis, *Intuitive Antecedents of Insight*, *in* THE CREATIVE COGNITION APPROACH 27, 46 (Steven M. Smith, Thomas B. Ward & Ronald A. Finkle eds., 1995).

[160] RUNCO, *supra* note 116, at 19; SAWYER, *supra* note 103, at 59.

[161] Sternberg & Lubart, *supra* note 105, at 11.

[162] SAWYER, *supra* note 103, at 58.

[163] *Id.* at 70.

[164] *E.g.*, SAWYER, *supra* note 103, at 73; Kevin Dunbar, *Science*, *in* 2 ENCYCLOPEDIA OF CREATIVITY, *supra* note 86, at 525, 529; Sandra Kay, *A Method for Investigating the Creative Thought Process*, *in* PROBLEM FINDING, PROBLEM SOLVING, AND CREATIVITY, *supra* note 146, at 116, 117; Richard E. Mayer, *Problem Solving*, *in* 2 ENCYCLOPEDIA OF CREATIVITY, *supra* note 86, at 437, 439.

with the next three stages.[165] Research indicates that some people are exceptional at finding problems, although they may not be as good at solving them; other people are found to be excellent at solving problems if the problem is presented to them.[166] The rare person is good at both.[167] Thus, it should not be surprising that the evidence indicates that the cognitive processes that occupy problem finding are not identical with those that take up problem solving.[168]

Finding and solving a problem fits naturally in the scientific disciplines.[169] Each of the different domains in science and engineering comes with widely shared beliefs—both theoretical and methodological.[170] Scientific thinkers seek to reformulate theories when facts emerge that are inconsistent with the prevailing beliefs, and inventors seek to use the existing theories to create new products or processes.[171] Because they are focused on external stimuli, scientists tend to be less concerned than artists are with their and others' internal emotional states.[172]

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[165] *Cf.* GARDNER, *supra* note 124, at 60–61 ("[A] human intellectual competence must entail a set of skills of problem solving—enabling the individual *to resolve genuine problems or difficulties* that he or she encounters and, when appropriate, to create an effective product—and must also entail the potential *for finding or creating problems*—thereby laying the groundwork for the acquisition of new knowledge.").

[166] RUNCO, *supra* note 116, at 16; Michael D. Mumford, Roni Reiter-Palmon & Matthew R. Redmond, *Problem Construction and Cognition: Applying Problem Representations in Ill-Defined Domains*, *in* PROBLEM FINDING, PROBLEM SOLVING, AND CREATIVITY, *supra* note 146, at 3, 8.

[167] Gerald Gordon & Edward V. Morse, *Creative Potential and Organizational Structure*, ACAD. MGMT. PROC. 37, 48 (1968).

[168] Sandra Kay, *The Figural Problem Solving and Problem Finding of Professional and Semiprofessional Artists and Nonartists*, 4 CREATIVITY RES. J. 233, 250 (1991).

[169] *See* Robert W. Weisberg, *Problem Solving and Creativity*, *in* THE NATURE OF CREATIVITY: CONTEMPORARY PSYCHOLOGICAL PERSPECTIVES, *supra* note 117, at 148, 160.

[170] *See* Stéphanie Z. Dudek & Rémi Côté, *Problem Finding Revisited*, *in* PROBLEM FINDING, PROBLEM SOLVING, AND CREATIVITY, *supra* note 146, at 130, 141.

[171] *See id.*

[172] Gregory J. Feist, *The Influence of Personality on Artistic and Scientific Creativity*, *in* HANDBOOK OF CREATIVITY, *supra* note 88, at 273, 283; *see also infra* text accompanying notes 173–81 (describing the artist's typical focus). That said, there are stylistic variations in the ways that different scientists go about their work. *See* Harrison G. Gough & Donald G. Woodworth, *Stylistic Variations Among Professional Research Scientists*, 49 J. PSYCHOL. 87, 93–96 (1960).

To some extent, it is hard to envision what a problem is that an artist[173] finds and solves,[174] especially compared with the easy fit of the concept in the sciences. One way to view the problem an artist seeks to solve in his art is "finding the best expression for one's self or one's thinking," be it in words, pictures, or sounds.[175] That view, however, is generic and capacious, leaving the artist's enterprise without a well-defined problem to solve.[176] A more refined and preferable understanding of art creation as problem solving, according to creativity scholars Jacob Getzels and Mihalyi Csikszentmihalyi, takes the role of the "artist . . . to be sensitive to salient life experiences, and to translate these into [artistic] products, thereby preserving as much of the impact of the experience as possible, while at the same time revealing meanings that were not perceived before the work of art was completed."[177] Finding the problem, then, is as much about deciding which artistic medium, materials, and represented objects will be used as it is about harnessing experiences and themes for artistic expression.[178] According to Csikszentmihalyi, "Artists find inspiration in 'real' life—emotions like love and anxiety, events like birth and death, the horrors of war, and a peaceful afternoon in the country."[179] Viewing the problem as such in the arts establishes it as one that is typically personal and subjective.[180] Not

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[173] Postmodern literary theory posits that artistic creativity is a fiction, as "no single work manifests creativity and innovation deriving from a unitary source." Kwall, *supra* note 27, at 871 (describing this theory). On this view, authorship is a collaboration between composers, publishers, marketers, the audience, and others. *See generally* Peter Jaszi, *Toward a Theory of Copyright: The Metamorphoses of "Authorship*,*"* 1991 DUKE L.J. 455 (discussing changing views towards authorship); Martha Woodmansee, *On the Author Effect: Recovering Collectivity*, *in* THE CONSTRUCTION OF AUTHORSHIP: TEXTUAL APPROPRIATION IN LAW AND LITERATURE 15 (Martha Woodmansee & Peter Jaszi eds., 1994) (describing a collective approach to authorship). Even if true, it does not negate the presence of a psychologically studied form of artistic creativity situated in the composers of art, which is detailed in this section. *Cf.* Hughes, *supra* note 103, at 93–95 (noting the possibility "that even as the process of intellectual production becomes more collaborative, personal *feelings* become more individualized and atomized"); Kwall, *supra* note 27, at 873 ("[T]he postmodern view ignores the reality that when an author borrows from the cultural fabric in crafting her work, it is still the unique combination of past efforts and the author's original contributions that invests the author's work with its unique and inviolate stamp."). Moreover, as Roberta Kwall notes, the concept of individual authorship "is the one that has prevailed and thus it cannot be readily removed from the discourse." *Id.* at 872.

[174] Weisberg, *supra* note 169, at 160.

[175] Mark A. Runco & Gayle Dow, *Problem Finding*, *in* 2 ENCYCLOPEDIA OF CREATIVITY, *supra* note 86, at 433, 435; *accord* Dudek & Côté, *supra* note 170, at 143.

[176] Runco & Dow, *supra* note 175, at 435.

[177] GETZELS & CSIKSZENTMIHALYI, *supra* note 117, at 154.

[178] *See, e.g.*, Catherine Patrick, *Creative Thought in Poets*, 26 ARCHIVES PSYCHOL. 1, 31 (1935) (finding, from a questionnaire, that "with the poets it is generally a mood which is incubated").

[179] CSIKSZENTMIHALYI, *supra* note 115, at 85.

[180] Robert S. Albert & Mark A. Runco, *The Possible Different Personality Dispositions of Scientists and Nonscientists*, *in* SCIENTIFIC EXCELLENCE 67, 84 (Douglas N. Jackson & J. Philippe Rushton eds., 1987); Mark A. Runco, *Conclusions Concerning Problem Finding, Problem Solving, and Creativity*, *in* PROBLEM FINDING, PROBLEM SOLVING, AND CREATIVITY, *supra* note 146, at 271, 286; *cf.* Dreyfuss, *supra* note 11, at 608 ("[C]reators appear to agree that the conceptualization process is intensely per-

surprisingly, then, psychological research shows that "artists [are] more sensitive to and expressive of internal emotional states than are scientists."[181]

Although it might seem counterintuitive to divide the sometimes slippery creative process into separate stages, the stages are useful descriptively. They are not meant to suggest that the stages proceed precisely chronologically or hierarchically.[182] For example, without knowing more about Picasso's creation of *Guernica*, one can plausibly imagine at least two scenarios: that Picasso started out the painting by identifying the theme of the destruction caused by bombing during the Spanish Civil War in the town of Guernica, or alternatively, that Picasso started out the painting with a series of visual images that were thematically constructed in retrospect. In the first situation, finding the problem preceded the solution, while the converse is true in the latter situation. Whatever the progression of creation, these steps are critical components of the creative process.

The four stages of creativity and their associated aspects of problem finding and problem solving are common to creativity in the very different domains of art, science, and engineering. Nonetheless, the literature reveals that society attaches weight to different aspects of the creative processes in these different domains.[183]

2. The Sciences and Engineering.—This section concentrates on aspects of creativity that are unique to its manifestation in the sciences, engineering, and invention. Within the scientific disciplines, there are a cluster of domains that can be quite different, such as biology and mechanical engineering.[184] This section, nonetheless, focuses on two features of creativity that are common to these different domains, namely, that understandings of scientific creativity particularly seem to value problem solving and that society is frequently happy to tolerate and celebrate a large degree of newness for creative efforts in the scientific disciplines.

a. The importance of problem solving.—Scientific creativity generates theories and inventions based on scientific and engineering princi-

sonal and largely self-generating."). Despite this characteristic, some artists, such as Picasso and Graham Greene, claim there is no personal expression in their works. Hughes, *supra* note 103, at 112.

[181] Feist, *supra* note 172, at 283.

[182] *See supra* text accompanying note 140.

[183] *Cf.* C.P. SNOW, THE TWO CULTURES: AND A SECOND LOOK: AN EXPANDED VERSION OF THE TWO CULTURES AND THE SCIENTIFIC REVOLUTION 4 (1965) ("Literary intellectuals at one pole—at the other scientists . . . . Between the two a gulf of mutual incomprehension—sometimes . . . hostility and dislike, but most of all lack of understanding.").

[184] *Compare, e.g.*, Daniel Saunders & Paul Thagard, *Creativity in Computer Science*, *in* CREATIVITY ACROSS DOMAINS: FACES OF THE MUSE, 153, 153–54 (James C. Kaufman & John Baer eds., 2005) (characterizing computer science as having "a strong mathematical component," "concerned with questions of how to accomplish some technological task rather than with scientific questions of why some natural phenomenon occurs" and using and building "machine[s] that can help with [computer scientists'] own investigation"), *with, e.g.*, Sternberg, *supra* note 117, at 131 (depicting physics as "find[ing] order in chaos").

ples. The psychological literature shows that society emphasizes problem solving over problem finding in the context of science and engineering.[185] Our culture cares about how well an invention grounded in scientific or engineering principles solves an identified problem rather than the fact that someone figured out that there was a problem in the first place.[186] The emphasis on problem solving is evident in society's celebration of someone's solution of a scientific or engineering problem as creative, even when that person did not personally find the problem.[187] For example, although others surely conceived of the need for a polio vaccine before Jonas Salk and Albert Sabin each solved the problem, society celebrates their solution and not the unknown problem finders.[188] Moreover, once a problem has been adequately solved in the sciences and engineering by an invention, society does not accord much weight to someone else's independent, identical solution,[189] in the way that society might be very happy to indulge each of two film or television products about a Mafia boss and his therapist.[190]

The emphasis on problem solving in scientific and engineering creativity is even more pronounced when it comes to scientific or engineering inventions—as compared with theoretical work in these domains—because the inventor seeks to produce something practical.[191] Unlike theoretical sci-

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[185] *See* CSIKSZENTMIHALYI, *supra* note 115, at 114.

[186] *See id.*; Bo T. Christensen & Christian D. Schunn, *The Relationship of Analogical Distance to Analogical Function and Pre-inventive Structure: The Case of Engineering Design*, 35 MEMORY & COGNITION 29, 31 (2007) ("Although engineering design certainly can involve experimentation, other kinds of activity are more prevalent and important, such as the construction, modification, and evaluation of novel and useful objects."); David Cropley & Arthur Cropley, *Engineering Creativity: A Systems Concept of Functional Creativity*, *in* CREATIVITY ACROSS DOMAINS: FACES OF THE MUSE, *supra* note 184, at 169, 171–72; Gordon & Morse, *supra* note 167, at 40 ("Organizations conducting scientific research . . . employ scientists whose major function is innovative problem solving."); Matthew I. Isaak & Marcel Adam Just, *Constraints on Thinking in Insight and Invention*, *in* THE NATURE OF INSIGHT, *supra* note 149, at 281, 310–11. *But cf.* Susan Merrill Rostan, *Problem Finding, Problem Solving, and Cognitive Controls: An Empirical Investigation of Critically Acclaimed Productivity*, 7 CREATIVITY RES. J. 97, 107 (1994) (finding that critically acclaimed scientists dedicate more time to problem finding than professionally competent scientists do).

[187] *Cf.* Runco, *supra* note 180, at 285 ("[P]roblem-finding skills may not always be necessary for creativity. Some presented problems probably allow creative solution.").

[188] *See generally* JANE S. SMITH, PATENTING THE SUN: POLIO AND THE SALK VACCINE (1990) (describing the creation of the polio vaccine).

[189] JOSEPH ROSSMAN, THE PSYCHOLOGY OF THE INVENTOR: A STUDY OF THE PATENTEE 13 (1931).

[190] *See* ANALYZE THIS (Village Roadshow Pictures 1999); *The Sopranos* (HBO television broadcast 1999–2007).

[191] *See* ROSSMAN, *supra* note 189, at 17–18; *accord* CSIKSZENTMIHALYI, *supra* note 115, at 114; Gerald Gordon, *The Identification and Use of Creative Abilities in Scientific Organizations*, *in* CLIMATE FOR CREATIVITY 109, 109 (Calvin W. Taylor ed., 1972); Paul Thagard & David Croft, *Scientific Discovery and Technological Innovation: Ulcers, Dinosaur Extinction, and the Programming Language Java*, *in* MODEL-BASED REASONING IN SCIENTIFIC DISCOVERY 125 (Lorenzo Magnani, Nancy J. Nersessian & Paul Thagard eds., 1999); Ryan D. Tweney, *Inventing the Field: Michael Faraday and the Creative "Engineering" of Electromagnetic Field Theory*, *in* INVENTIVE MINDS: CREATIVITY IN TECHNOLOGY 31, 33 (Robert J. Weber & David N. Perkins eds., 1992).

entists, the inventor is thinking about the uses to which his creation might be put in crafting the creation in the first instance.[192]

Studies show that scientists and engineers who are good at problem solving are more successful on many metrics than those who are not.[193] One study shows that researchers in an industrial research-and-development organization who were good problem solvers wrote up significantly more project disclosures and had more patent applications and patents than those who were not.[194] Research also shows that implicit theories of scientific creativity highlight the role of problem solving. An implicit theory of creativity means the collection of beliefs that people inherently seem to hold about creativity.[195] Scholars think that implicit theories of creativity form the basis for what the field—a domain's gatekeepers—evaluates as a sufficient contribution to the relevant domain.[196] One study demonstrates that engineers believe that having solutions, developing valuable answers, and being analytical are essential to scientific creativity.[197] According to another study, physicists think that creativity entails the ability to find order in chaos, approximate solutions, locate shortcuts in problem solving, and go beyond standard methods of problem solving.[198] Moreover, laypeople think that scientific creativity is about problem solving.[199]

In line with the emphasis in science and engineering on problem solving, many scholars think that scientific creativity is very much about con-

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[192] ROSSMAN, *supra* note 189, at 67–79 (collecting inventors' statements about their creative process).

[193] *E.g.*, Gordon & Morse, *supra* note 167, at 46, 47 fig.5.

[194] *Id.* (indicating also that, of the problem solvers, those who were also good at problem finding had the highest of these measures). This study correlates the number of project disclosures and patent applications with success. Of course, this correlation is not absolute, as one could imagine someone creating one breakthrough invention—such as an AIDS vaccine—and nothing more. That surely ought to count as success. That said, such a situation is atypical, and a steady stream of inventions that arguably qualify for patents ought to indicate more success than a trickle or absence of them.

[195] Robert J. Sternberg, *Implicit Theories of Intelligence, Creativity, and Wisdom*, 49 J. PERSONALITY & SOC. PSYCHOL. 607, 608 (1985).

[196] Mark A. Runco, *Implicit Theories and Ideational Creativity*, *in* THEORIES OF CREATIVITY, *supra* note 132, at 234, 248–49; Sternberg, *supra* note 195, at 608.

[197] Thomas B. Sprecher, *A Proposal for Identifying the Meaning of Creativity*, *in* SCIENTIFIC CREATIVITY: ITS RECOGNITION AND DEVELOPMENT, *supra* note 128, at 77, 84–85.

[198] Sternberg, *supra* note 195, at 624.

[199] Mark A. Runco & Michael D. Bahleda, *Implicit Theories of Artistic, Scientific, and Everyday Creativity*, 20 J. CREATIVE BEHAV. 93, 96 tbl.1 (1986). Psychological research shows that problem solving is particularly valued in scientific domains in which there is strong consensus about the domain's conceptual structure, such as biology and chemistry. John M. Wilkes, *Characterizing Niches and Strata in Science by Tracing Differences in Cognitive Styles Distribution*, *in* THE SOCIAL PSYCHOLOGY OF SCIENCE 300, 304–07 (William R. Shadish & Steve Fuller eds., 1994). In these domains, problem finding is less important because "demands on the individual for problem identification and conceptualization are greatly reduced." *Id.* at 304. By contrast, the same research indicates that scientific domains with underdeveloped, incomplete, or conflicting conceptual frameworks need thinkers who are good problem finders as well as those who are excellent problem solvers. *Id.*

vergent thinking—that is, working on a problem for which there is a single best answer (as compared to the divergent thinking in solving an open-ended task for which there are multiple solutions).[200] Although some think that convergent thinking is not about creativity,[201] the better view is that "artful convergent thinking can lead to the transcending of boundaries."[202]

Of course, problem finding remains significant in the sciences. As Albert Einstein once wrote, "The formulation of a problem is often more essential than its solution . . . . To raise new questions, new possibilities, to regard old problems from a new angle, requires imagination and marks real advance in science."[203] Without the finding of good problems to solve, technological innovation could not happen.[204] For two reasons, Einstein's view does not contradict the emphasis on problem solving in the sciences, particularly in inventing. First, as explained above, Einstein's outlook is more typical of theoretical science than of the more practical exercise of inventing.[205] By contrast, work in theoretical science is frequently about reconceptualizing that which is already accepted in the relevant body of knowledge, which requires the scientist to find parts of that corpus of knowledge that are in need of reexamination.[206] Second, society tends not to appreciate valuable found problems in the sciences and engineering, particularly with regard to invention, unless the problem is solved. An AIDS vaccine is an important identified problem and a critical precursor to a solution by encouraging research on the problem, but it accrues its full value only upon a solution.

b. Large degrees of newness.—Just as the emphasis on problem solving is particular to creativity in the sciences and engineering, so is the

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[200] *See* LIAM HUDSON, CONTRARY IMAGINATIONS: A PSYCHOLOGICAL STUDY OF THE ENGLISH SCHOOLBOY 41–42 (1966) (finding in a study that science students tend to be convergent thinkers); RICHARD S. MANSFIELD & THOMAS V. BUSSE, THE PSYCHOLOGY OF CREATIVITY AND DISCOVERY 46–47 (1981) (finding that divergent thinking is not as important for scientific creativity as other types of creativity).

[201] SAWYER, *supra* note 103, at 44–45 (describing, but rejecting, this view).

[202] David N. Perkins, *The Topography of Invention*, *in* INVENTIVE MINDS: CREATIVITY IN TECHNOLOGY, *supra* note 191, at 238, 249.

[203] ALBERT EINSTEIN & LEOPOLD INFELD, THE EVOLUTION OF PHYSICS 95 (1938).

[204] *See* Christensen & Schunn, *supra* note 186, at 31 ("*[P]roblem identification* may be an important function, especially in the early conceptual stages of engineering design."); M. Csikszentmihalyi & J.W. Getzels, *Creativity and Problem Finding in Art*, *in* THE FOUNDATIONS OF AESTHETICS, ART, & ART EDUCATION 91, 112–14 (Frank H. Farley & Ronald W. Neperud eds., 1988); Sawyer, *supra* note 11, at 473–78.

[205] *See supra* text accompanying note 191.

[206] *See supra* text accompanying note 191. For example, it was quite important to astronomy when Fritz Zwicky detected that a certain galaxy cluster had approximately 400 times the mass as could be visually observed. *See* F. Zwicky, *On the Masses of Nebulae and of Clusters of Nebulae*, 86 ASTROPHYSICAL J. 217 (1937). Zwicky had, in effect, found a problem with existing theories of astronomy, which did not know how to handle this data, and his discovery eventually led to the proposal that there is an abundance of dark matter—directly undetectable matter—throughout the universe. *See, e.g.*, MARK J. HADLEY, CLASSICAL DARK MATTER (2007).

aspiration for newness, even large degrees of it, in invention in these areas.[207] In fact, this quest for newness is part and parcel of the creative process for technological inventions: studies show that people come up with a solution to a scientific or engineering problem only after exhausting the more obvious potential solutions.[208]

More importantly, our culture is typically happy to accept technological inventions that flout accepted conventions and make great leaps in newness.[209] Once society becomes convinced of an invention's utility and so long as it can integrate the invention into the fabric of its members' lives, it will tend to embrace the invention, even if the invention is very new.[210] One pertinent illustration of society's easy acceptance of significantly new technology is the telephone. Not long after the telephone's introduction, a number of society's sectors began using it.[211] First, businesses began to use it to communicate without the middleman of the operator required to use the telegraph.[212] Soon, farmers began using telephones, often with their wire fences as telephone wires, and urban telephone systems also began to spring up.[213] According to historian Robert Friedel, "Within a decade of its first appearance, the telephone had redefined the possibilities of personal communication."[214] The telephone is far from the only example of society's desire to use very new inventions. One survey shows the great willingness of older people to use new technologies like sensors to detect falls to ensure their safety at home.[215] Another study shows that consumers are open to us-

[207] The same might not hold true for scientific theories, which I do not address in this section, as they are typically outside the scope of intellectual property protection and thus less relevant to this Article's analysis. *See infra* Part III.C.1.

[208] SIMONTON, *supra* note 134, at 53.

[209] David Glen Mick and Susan Fournier highlight how "the American public tend[s] to link newness with improvement" when it comes to technology, a fixation in American culture. David Glen Mick & Susan Fournier, *Paradoxes of Technology: Consumer Cognizance, Emotions, and Coping Strategies*, 25 J. CONSUMER RES. 123, 124 (1998); *cf.* Elizabeth C. Hirschman, *Innovativeness, Novelty Seeking, and Consumer Creativity*, 7 J. CONSUMER RES. 283, 284 (1980) ("The basic notion underlying the construct of novelty seeking appears to be that through some internal drive or motivating force the individual is activated to seek out novel information.").

[210] *E.g.*, Fred D. Davis, Richard P. Bagozzi & Paul R. Warshaw, *User Acceptance of Computer Technology: A Comparison of Two Theoretical Models*, 35 MGMT. SCI. 982, 985, 996–97 (1989).

[211] ROBERT FRIEDEL, A CULTURE OF IMPROVEMENT: TECHNOLOGY AND THE WESTERN MILLENNIUM 317–18 (2007).

[212] *Id.* at 317 (describing how early telephones "provid[ed] direct communications between offices and factories, between stores and warehouses, between shippers and receivers").

[213] *Id.*

[214] *Id.* at 317–18.

[215] Press Release, Am. Assoc. of Homes & Servs. for the Aging, Research Finds Older People Want to Use Technology to Help Them Remain at Home (Mar. 29, 2008), http://www.aahsa.org/article.aspx?id=720.

ing quite new nanotechnology inventions, such as skin lotion and car tires.[216]

With at least one significant class of new inventions, the more newness, the better. When an invention does not require its users to learn anything new or change their usage patterns, they are inclined to adopt the invention more readily.[217] As described by two researchers in the area:

> [T]he radical innovation of substituting the vacuum tube with the transistor is a technological breakthrough for the radio market, but it requires little from consumers in terms of usage pattern changes or new learning. Yet another example is the recent set of technological breakthroughs in new materials to speed the processing capabilities of computer chips (from silicon to gallium arsenide to silicon germanium). From the consumers' perspective, this innovation has little impact on their adoption and use patterns; these are just subsequent generations of PCs that operate at a higher speed.[218]

These examples conversely indicate certain limitations on society's acceptance of very new inventions, which might not be as easily adopted if they are difficult to use.[219] Research shows that people can have mixed feelings about technology. They can be optimistic that innovative technology will "offe[r] people increased control, flexibility, and efficiency in their lives," but they can also feel overwhelmed by the difficulty of using new technology and insecure about the technology working properly.[220] When a technology is relatively easy to use, people's negative feelings about technology tend to dissipate, leaving only the positive.[221]

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[216] Steven C. Currall, Eden B. King, Neal Lane, Juan Madera & Stacey Turner, *What Drives Public Acceptance of Nanotechnology?*, 1 NATURE NANOTECHNOLOGY 153, 154, 155 fig.2 (2006) (defining nanotechnology as "human-designed materials or machines at extremely small sizes (atomic or molecular level) that have unique chemical, physical, electrical, or other properties" (internal quotation marks omitted)).

[217] Yikuan Lee & Gina Colarelli O'Connor, *The Impact of Communication Strategy on Launching New Products: The Moderating Role of Product Innovativeness*, 20 J. PROD. INNOVATION MGMT. 4, 7–8 (2003).

[218] *Id.*

[219] *Id.* at 8.

[220] A. Parasuraman, *Technology Readiness Index (TRI): A Multiple-Item Scale to Measure Readiness to Embrace New Technologies*, 2 J. SERVICE RES. 307, 311 (2000); *cf.* EVERETT M. ROGERS, DIFFUSION OF INNOVATIONS 238–40 (1983) (evaluating innovations as to their relative advantage, compatibility, trialability, observability, and complexity, and suggesting that the first four characteristics are positively related to speed of diffusion and the last is negatively related); Mick & Fournier, *supra* note 209, at 124 ("In the United States the positive meanings of technology continue to center around liberty, control, and efficiency, which represent core American values identified by Tocqueville over 150 years ago." (citation omitted)); *id.* at 126 tbl.1 (identifying eight paradoxes of technological products: control/chaos, freedom/enslavement, new/obsolete, competence/incompetence, efficiency/inefficiency, fulfills/creates needs, assimilation/isolation, and engaging/disengaging).

[221] Davis, Bagozzi & Warshaw, *supra* note 210, at 985, 996–97 (demonstrating that "two particular beliefs, *perceived usefulness* and *perceived ease of use*, are of primary relevance for computer acceptance behaviors"); *see also* Lee & O'Connor, *supra* note 217, at 5 ("A successful innovation must be novel and, at the same time, easy to comprehend."); Parasuraman, *supra* note 220, at 316–17 (discussing

Overlaid on this analysis is also the possibility that some new technologies might subvert existing social norms, making it harder to gain societal acceptance. For example, Gaia Bernstein documents how some have resisted artificial insemination technologies because of their enabling of procreation outside of the traditional conception of the nuclear family.[222] This possibility, though, is less about how new the relevant technology is than how directly it implicates existing societal values.

In sum, creativity in the scientific and engineering domains, particularly in the areas of invention, is distinguished by an emphasis on problem solving over problem finding and by the often easy acceptance of large degrees of newness in consuming these works. These distinctions are particularly salient when compared with creativity in artistic domains, to which I now turn.

3. The Arts.—This section addresses some pertinent aspects of creativity that are unique to its manifestation in the arts. As with the sciences and engineering, the arts encompass a number of domains that can be quite different, such as poetry, prose, painting, sculpture, and music.[223] This section, nonetheless, focuses on the features of creativity common to these different artistic domains. Unlike creativity resulting in scientific and engineering inventions, artistic creativity particularly esteems problem finding, and society usually psychologically prefers artistically creative products with some, but not too much, newness.

a. The importance of problem finding.—Although artistic creativity shares the same four stages as creativity in science and engineering, in the context of art there is an emphasis on problem finding over problem solving. The psychological literature on creativity in the artistic domains indicates that the most significant predictor of original and successful art is

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the interplay between the "drivers" of optimism and innovation and the "inhibitors" of discomfort and insecurity). For new inventions to be accepted, then, they also have to be capable of being properly marketed. Lee & O'Connor, *supra* note 217, at 5, 8; Robert J. Sternberg, *"We Want Creativity! No, We Don't!"*, 4 RES. MULTI-LEVEL ISSUES 93, 98 (2005). Moreover, some very new inventions are not appropriate, which is the other key ingredient in creativity. Typically, a very new invention is inappropriate if there is no way to engineer the invention or if the market for it is too abstract. *Id.* (citing as examples Leonardo da Vinci's flying machine, which could not be implemented at the time, and the now commonplace fax machine, which had no market for some time after it was introduced).

[222] Gaia Bernstein, *The Socio-Legal Acceptance of New Technologies: A Close Look at Artificial Insemination*, 77 WASH. L. REV. 1035, 1041–42 (2002).

[223] *Compare, e.g.*, Jane Piirto, *The Creative Process in Poets*, *in* CREATIVITY ACROSS DOMAINS: FACES OF THE MUSE, *supra* note 184, at 1, 1 (describing poetry as being about "the musical sense of making rhythm and rhyme, consonance and dissonance in conscious or unconscious patterns," "the interest in inner probing of the self," "the need to see life more deeply than most, and if so, to tell about it in formal patterns of language," and the formulation of "an image that relates metaphorically to what is being discussed so that the thing itself breaks open and is illuminated"), *with, e.g.*, Enid Zimmerman, *Should Creativity Be a Visual Arts Orphan?*, *in* CREATIVITY ACROSS DOMAINS: FACES OF THE MUSE, *supra* note 184, at 59, 65 (noting that one way to define creativity in art is as "a range of multidimensional processes that includes knowledge of art concepts and traditions in a culture, creative thinking skills, and intrinsic motivation").

how good the artist is at problem finding. In the leading study on this issue, Getzels and Csikszentmihalyi followed thirty-one artists from the time that they were art students for eighteen years.[224] They set up an art studio and placed within it twenty-seven objects that might be used as components in a still-life drawing, such as a small mannequin, a bunch of grapes, a brass horn, a glass prism, and a steel gearshift.[225] According to the experimenters, the objects were chosen "to give the greatest possible variety for simple and complex, human and mechanical, abstract and concrete choices."[226] The artists participating in the study were told to select any subset of the objects and draw them.[227] Judges—both art experts and laypeople—were then asked to rank the resulting drawings based on each of three measures: technical skill, originality, and its overall aesthetic value.[228]

There was a significant correlation between the subjects' efforts at problem finding and the subjects' ranking on originality—as colloquially understood—and aesthetic value.[229] Getzels and Csikszentmihalyi found that the students who focused their attention most on problem finding—on choosing which objects to draw from the group of twenty-seven—selected more complex and unusual objects and generated drawings that independent professional art experts judged to be more original.[230] As for the students who focused on problem solving by quickly choosing objects (often having come to the situation with canned ideas) and spending most of their allocated time on the drawing, their work was adjudged to be less original and more craftsmanlike.[231] When Getzels and Csikszentmihalyi looked into these subjects' art careers seven and eighteen years later, they found that the most successful of the subjects—both in the marketplace and aesthetically—were the ones that engaged in the most dedicated problem finding all

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[224] GETZELS & CSIKSZENTMIHALYI, *supra* note 117; Csikszentmihalyi & Getzels, *supra* note 204, at 93.

[225] GETZELS & CSIKSZENTMIHALYI, *supra* note 117, at 85.

[226] *Id.*

[227] *Id.* (giving the subjects as much time to select and draw as they wanted).

[228] *Id.* at 108. There were four panels of five judges each, respectively made up of established artists and art critics, art teachers, doctoral students in theoretical mathematics, and graduate business students. *Id.*

[229] *Id.* at 123–26 (noting the significance of the correlation between originality and problem finding, even if overall aesthetic value and technical skill are held constant). The variables measuring problem finding that Getzels and Csikszentmihalyi discovered to be significantly related to originality scores were the following: at the pre-drawing stage, the number of objects manipulated, the uniqueness of the objects chosen, and the exploratory behavior during selection and arrangement of the objects; at the drawing stage, discovery-oriented behavior, such as changing media or paper, and changes made to the problem structure or drawing content, such as changes in perspective or position; and at the post-drawing evaluative stage, concern for problem finding. *Id.* at 126, 129.

[230] *Id.* at 127–28.

[231] *Id.* at 128.

those years ago in the experimental studio, thereby underscoring the prominence of problem finding in successful, original art.[232]

Psychologists have found similar evidence of the importance of problem finding in other artistic domains, such as creative writing[233] and poetry.[234] In a poetry study by Catharine Patrick, subjects—both established poets and a control group—were presented with a picture of a landscape and then told to write a poem about it or how they felt looking at it.[235] This study's results reveal the importance of problem finding in artistic creativity in two ways. First, as compared with the control group, the established poets generally wrote about topics other than the presented picture.[236] As Patrick explained, "The poet has a wider imagination and his association of ideas is not limited so much by the stimulus. The picture merely serves as a starter for various other ideas, which press in upon his mind. The control, who has not written before, does not appear to think of much more than the picture itself."[237] Second, the successful poets saw much wider significance in the landscape scene than the control group and thus focused less on the mechanics of verse writing and more on the meaning of the poem's message.[238]

In measuring originality and artistic success, then, it seems that our society attaches more weight to problem finding in the arts than to the other parts of the creative process. These results are consistent with psychologists' observations that constructing or constraining problems is most important in domains that are not well-defined, "where the pertinent goals, pertinent parameters, requisite information, and available solution strategies are unknown or poorly articulated."[239] Although each artistic domain is

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[232] *Id.* at 161–80; Csikszentmihalyi & Getzels, *supra* note 204, at 101 tbl.3.1. Specifically, the number of objects the subject manipulated when selecting them, the amount of exploration of the objects at this time, the proportion of the total drawing time that had passed before the drawing's final structure was recognizable, and the artist's articulated concern with problem formulation were significantly correlated with success as an artist. GETZELS & CSIKSZENTMIHALYI, *supra* note 117, at 172–80.

[233] Michael T. Moore, *The Relationship Between the Originality of Essays and Variables in the Problem-Discovery Process: A Study of Creative and Noncreative Middle School Students*, 19 RES. TEACHING ENG. 84, 86–92 (1985). A study of collage-making, an artistic effort not requiring the technical skills that drawing might, found that the time spent on problem finding correlated significantly with the collage's aesthetic quality and that the total time spent on problem finding and solving correlated significantly with aesthetic quality and originality. Dudek & Côté, *supra* note 170, at 137–39. The study's authors suggest that the differences from the findings in the Getzels and Csikszentmihalyi study are owed to the task's differences. Because the photographs used in the collage were not objects to be drawn but to be pasted on cardboard, they had to be reoriented in completing the problem, so much more finding, or constraining, of the problem was occurring during the solution phase. *Id.* at 139.

[234] Patrick, *supra* note 178, at 13–16, 68.

[235] *Id.* at 13–16.

[236] *Id.* at 68.

[237] *Id.*

[238] *Id.*

[239] Mumford, Reiter-Palmon & Redmond, *supra* note 166, at 8–9.

characterized by conventions, unlike in the sciences and engineering, the particular goals of the various arts are notoriously ill defined,[240] which is why locating and constraining a problem is so important to successful art. That is, quite unlike the emphasis many place in scientific and engineering invention on convergent thinking,[241] artistic creativity requires divergent thinking, in which the creator faces an open-ended task for which there are multiple solutions.[242] As explained by psychologists studying the issue, "[T]he presence and consideration of [problem] constraints may in fact contribute to creativity by facilitating the generation of more accurate and coherent problem constructions."[243] By spending time laying down the problem's parameters at the outset, artists help direct themselves toward a solution, the final expression conforming to the parameters.[244] As Getzels and Csikszentmihalyi theorize in the context of their study of art students:

> Students who take more time finding the problem give themselves a chance to consider a greater variety of objects and combinations (or a greater number of problematic elements and relations), and to discover more unusual objects (or unique problematic elements), thus providing the conditions for the emergence of problems that are more original.[245]

Consistent with an elevated view of problem finding, the most frequently given reason by artists for making art is not beauty or any other aesthetic goal, but rather discovery or understanding.[246] Their personality profiles fit the view of the artist as a good problem finder. According to Getzels and Csikszentmihalyi, the artist is typically "cut off from others, . . . has an intense inner life, . . . does not depend on outside direction and support, [which allows the artist] to break away from the premises on which the majority bases its thinking" and "restructur[e] old problems or discove[r] new ones."[247]

Implicit theories of artistic creativity, unlike theories of scientific creativity, also indicate the centrality of problem finding to creativity in the arts. For example, art professors think creativity entails risk taking, imagination, originality, and willingness and ability to try out new ideas.[248]

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[240] CSIKSZENTMIHALYI, *supra* note 115, at 114; Gordon, *supra* note 191, at 109.

[241] *See supra* text accompanying notes 200–02.

[242] SIMONTON, *supra* note 134, at 58; *cf.* HUDSON, *supra* note 200, at 41–42 (finding in a study that art students tend to be divergent thinkers).

[243] Mumford, Reiter-Palmon & Redmond, *supra* note 166, at 31.

[244] Kay, *supra* note 164, at 119.

[245] GETZELS & CSIKSZENTMIHALYI, *supra* note 117, at 128; *see also id.* at 134 ("[A] person who starts drawing without a clearly envisioned, standard aesthetic structure in mind, but lets the problem emerge in the situation will end up making something that will be thought to be original.").

[246] *Id.* at 19–20.

[247] *Id.* at 40.

[248] Sternberg, *supra* note 195, at 623–24. In another study, artists thought artistic creativity was about being expressive, imaginative, humorous, open-minded, unique, emotional, and exciting. Runco & Bahleda, *supra* note 199, at 96 tbl.1.

Just as problem finding is still important in scientific and engineering inventions, problem solving is relevant to successful art. Writers, for example, spend a great deal of time choosing their words with care to express the underlying themes, emotions, and subjects which they have chosen to use in their work.[249] Nonetheless, as expressed by one creativity researcher, the "quality of a solution depends upon the quality of the problem."[250] Problem-finding studies that focus on choosing objects to represent in artistic works suggest that the most creative works are produced by "touch[ing] more objects, manipulat[ing] more objects, ch[oosing] more unique objects and spen[ding] more time at this [preproducing] stage of the problem."[251] So doing allows the artist to see "more relationships between objects" and to "attempt to understand a deeper structure in the relationship among objects and how they co-occur[, which] has an effect on the originality of the written product."[252] Consistently, psychological work shows that the found problem in the arts tends to linger with the audience much longer than the particular solution.[253] The artistic solution, in effect, is the expression, or vehicle, for the themes, meaning, and emotion essential to the found artistic problem. Without it, artistic expression becomes nothing more than *Jabberwocky*.[254]

Whether the weight attached to problem finding in the artistic domains is due to the human psychological makeup or to our constructions of culture is not fully known. That said, many creativity scholars attribute it to the latter. Keith Sawyer indicates, for example, that the artist through much of European history was primarily thought of as a craftsman:

> When a noble contracted for a work with a painter, the contract specified details like the quantities of gold and blue paint to appear in the work, the deadline, and penalties for delays . . . . In some contracts, artists were paid by the time worked rather than a fixed price for the completed work. These contract

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[249] *See* GARDNER, *supra* note 124, at 73–75 (describing the writing process of T.S. Eliot and others).

[250] Runco, *supra* note 180, at 285; *accord* Michael D. Mumford et al., *Process Analytic Models of Creativite Capacities*, 4 CREATIVITY RES. J. 91, 101 (1991).

[251] Moore, *supra* note 233, at 92.

[252] *Id.*

[253] *See* COLIN MARTINDALE, THE CLOCKWORK MUSE: THE PREDICTABILITY OF ARTISTIC CHANGE 42–43 (1990) ("[T]he more meaningful something is, the better people like it. At least for artistically naïve observers, meaning is by far the most important determinant of preference." (citing Colin Martindale, Kathleen Moore & Alan West, *Relationship of Preference Judgments to Typicality, Novelty, and Mere Exposure*, 6 EMPIRICAL STUD. ARTS 79 (1988)).

[254] *See* LEWIS CARROLL, THROUGH THE LOOKING-GLASS AND WHAT ALICE FOUND THERE 12 (1872) ("'Twas brillig, and the slithy toves/ Did gyre and gimble in the wabe;/ All mimsy were the borogoves,/ And the mome raths outgrabe."). For background on the nonsense verse comprising this poem, see *Jabberwock,* ENCYCLOPÆDIA BRITANNICA ONLINE, http://www.britannica.com/EBchecked/topic/1698852/Jabberwock (last visited Oct. 24, 2010).

details show us that art was considered to be a trade—a very different conception of the artist than we hold today.[255]

Sawyer suggests that it was only in the late Renaissance period that the artist was no longer seen as a craftsman, but as an "inspired innovator[], [with] the function of art [transforming] to communicate the inner insights of the artist to the viewer."[256]

b. Not too much newness.—Problem finding is not the only thing particular to artistic creativity. In the arts, while the newness component of creativity is valued in our individualist culture, for typical audience members and in most artistic contexts—as explained herein—it is important that artists not stray too far from accepted conventions, a concern that is not present in scientific and engineering invention.[257] Consider the case of music. Keith Sawyer explains its conventions:

> To begin with the most basic level, all musical notes are grouped into octaves; octaves have 12 equal tones; chords are formed in major, minor, and dominant sevenths. Over the last several centuries, a system of music notation developed in Europe to represent this 12-tone system on the page, and the widespread acceptance of the same notational conventions allows music composed anywhere to be played by musicians trained anywhere. All musicians play one of a standard set of instruments; these instruments are manufactured and can be purchased easily, teachers for the instruments can be found in almost any city, and books of technique are published for the aspiring instrumentalist.[258]

In 1930, Harry Partch made a notable effort to create another musical language. He devised a forty-three-tone scale, developed his own form of musical notation for this scale, created musical compositions for this scale, and invented new instruments that could play all forty-three tones.[259] Because no manufacturer saw an economic upside to making instruments that no one else knew how to play, Partch had to make the instruments himself.[260] As no one could play these instruments, Partch could have his compositions performed only if he trained whole orchestras, which took approximately one year.[261] His musical compositions sound extremely different than musical compositions intended for conventional musical instru-

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[255] SAWYER, *supra* note 103, at 13 (citations omitted).

[256] *Id.*; *accord* WEINER, *supra* note 114, at 58 (pinpointing the Renaissance as the time when creativity's origin was no longer seen as divine but personal to the artist or scientist); Albert & Runco, *supra* note 88, at 18–19 (noting that perspectives on creativity changed during the Renaissance).

[257] Gruber & Wallace, *supra* note 115, at 94–95.

[258] SAWYER, *supra* note 103, at 237–38.

[259] *Id.* at 238. To sample some of Partch's instruments, see *American Mavericks: Harry Partch's Instruments*, AMERICAN PUBLIC MEDIA, http://musicmavericks.publicradio.org/features/feature_partch.html (last visited June 1, 2010).

[260] SAWYER, *supra* note 103, at 238.

[261] *Id.*

ments on the twelve-tone scale.[262] Partch was unquestionably innovative in his musical activity, probably more so than many commercially successful musicians. Nonetheless, the resulting compositions flowing from his notational and instrumental innovations lacked appropriateness in the culture, as they strayed too far from musical convention to be widely accepted.[263]

What Partch's story demonstrates anecdotally has been established by psychological research more systematically. According to the psychologist Daniel Berlyne, how much someone likes a work of art directly relates to its arousal potential, which is a measure of its newness, complexity, surprise, unpredictability, and psychophysical characteristics (such as pitch or hue).[264] But that is true only up to a point, after which there is too much arousal and the person's feelings for the artwork turn sharply to dislike.[265] Dean Keith Simonton's research verifying this theory demonstrates that "[c]reative artists must generate original ideas, yet that originality cannot go too far from some implicit or explicit baseline, such as a certain aesthetic style or tradition."[266] Simonton studied 15,618 themes in the classical music repertoire, which account for more than 99% of classical music listening.[267] He found that the relationship between the melodic originality of a theme[268]

[262] *See, e.g.*, Harry Partch, *American Mavericks: The Bewitched*, AMERICAN PUBLIC MEDIA, http://www.publicradio.org/tools/media/player/musicmavericks/partch_bewitched (last visited June 1, 2010) (produced in association with the San Francisco Symphony).

[263] SAWYER, *supra* note 103, at 239. Of course, the lack of appropriateness also stemmed from the monetary and other costs associated with staging his works, a concern that finds a direct analogue in the sciences when even groundbreaking advances (such as those in quantum computing) are sometimes too costly to produce at a profit. *Discovery Could Pave the Way for Quantum Computing*, PHYSORG.COM (Mar. 18, 2010), http://www.physorg.com/news188145015.html. Moreover, the lack of appropriateness generally in society is not to say that Partch does not have devoted followers, some for his more conventional musical works and some for his more eccentric efforts. *See, e.g.*, Harry Partch Information Center, http://www.harrypartch.com (last visited June 1, 2010).

[264] D.E. BERLYNE, AESTHETICS AND PSYCHOBIOLOGY 64–71, 81–90, 193 (1971).

[265] *Id.* at 88–90, 193. A cognitive theory, based on the network model of the mind, is mostly consistent with the psychobiological arousal theory. Colin Martindale, Kathleen Moore & Alan West, *Relationship of Preference Judgments to Typicality, Novelty, and Mere Exposure*, 6 EMPIRICAL STUD. ARTS 79, 82–85 (1988). Creative people tend to prefer complexity, novelty, and surprise more than the general public, meaning that when creators are autonomous—in that they are not reliant on the approval of the general public—their work tends to be more daring. MARTINDALE, *supra* note 253, at 52.

[266] Dean Keith Simonton, *Creativity in Personality, Developmental, and Social Psychology: Any Links with Cognitive Psychology?*, *in* CREATIVE THOUGHT: AN INVESTIGATION OF CONCEPTUAL STRUCTURES AND PROCESSES, *supra* note 128, at 309, 311 (concluding that "the success of a work of art is often a curvilinear, inverted-U function of its originality"); *accord* MARTINDALE, *supra* note 253, at 42.

[267] Simonton, *supra* note 266, at 311; Dean Keith Simonton, *Thematic Fame, Melodic Originality, and Musical Zeitgeist: A Biographical and Transhistorical Content Analysis*, 38 J. PERSONALITY & SOC. PSYCHOL. 972, 975 (1980).

[268] Simonton defines melodic originality as "the appearance of unusual combinations of notes within a particular theme," involving "the occurrence both of chromatic notes or less commonly used diatonic notes and of rare intervals between consecutive notes." Dean Keith Simonton, *Thematic Fame and*

and its aesthetic impact on society (measured by information such as performance frequencies and number of recordings) is that of an inverted backwards J curve.[269] The aesthetic impact of a theme increases with increasing melodic originality, but only up to a certain point, after which it decreases sharply.[270] The themes that predominate the classical music landscape are those with "a medium level of predictability": themes that "follow the structure of the scales that define diatonic music but add enough surprises, such as chromatic notes and unusual intervals, to manifest the necessary [newness]."[271] The least liked (and the least famous) themes are those with the most original tonal combinations.[272] Other studies reveal similar results with regard to other artistic domains like poetry[273] and art.[274]

Over time, as a typical audience of a category of artistic works becomes habituated to a certain quantum of newness, the degree needed to arouse it increases and artistic works in that category must be that much more new to succeed.[275] Simonton's study of classical music bears out this trend of escalating newness:[276] "Compare the modal music of the Renaissance to the chromaticism of Chopin and Wagner, and from there proceed to the atonal and serial music of Schoenberg and after."[277] The psychologist Colin Martindale shows this same gradual progression in a variety of other artistic domains, such as poetry,[278] short stories,[279] lyrics in popular music,[280] painting,[281] and even ancient art.[282] In sum, as time passes, typical audience members of a category of artistic works enjoy what would have been too new and different—such as experimental music or cubism—some time earlier.

Melodic Originality in Classical Music: A Multivariate Computer-Content Analysis, 48 J. PERSONALITY 206, 208 (1980).

[269] Simonton, *supra* note 266, at 311; Simonton, *supra* note 267, at 977.

[270] Simonton, *supra* note 266, at 311; Simonton, *supra* note 267, at 977.

[271] Simonton, *supra* note 266, at 311.

[272] MARTINDALE, *supra* note 249, at 44–47; Simonton, *supra* note 266, at 311; Simonton, *supra* note 267, at 977.

[273] Richard Kammann, *Verbal Complexity and Preferences in Poetry*, 5 J. VERBAL LEARNING & VERBAL BEHAV. 536, 537–40 (1966).

[274] Hy Day, *Evaluations of Subjective Complexity, Pleasingness and Interestingness for a Series of Random Polygons Varying in Complexity*, 2 PERCEPTION & PSYCHOPHYSICS 281, 282–85 (1967) (examining polygons); Paul C. Vitz, *Preference for Different Amounts of Visual Complexity*, 11 BEHAV. SCI. 105, 106–10, 111–13 (1966) (analyzing line drawings).

[275] Simonton, *supra* note 268, at 208.

[276] *Id.* at 214; Simonton, *supra* note 267, at 979–80.

[277] Simonton, *supra* note 266, at 311–12.

[278] MARTINDALE, *supra* note 253, at 79–156 (studying French, British, and American poetry).

[279] *Id.* at 169–74.

[280] *Id.* at 177–78.

[281] *Id.* at 180–82.

[282] *Id.* at 185–200.

Demonstrating further that artists' work typically involves intermediate degrees of predictability, artists—including the most successful ones—tend to revisit the same themes over time. For example, Philip Roth often writes about secular American Judaism in the face of Jewish tradition,[283] and Pablo Picasso's paintings are grouped into periods, such as the Blue Period, for his somber blue paintings,[284] and the Rose Period, for his more cheerful pink and orange paintings.[285] Successful artists are more likely than unsuccessful ones to believe that an artistic work is never fully completed, in the sense that eliminating or changing elements in the work will not destroy the work's character.[286] In that vein, successful artists tend to create a work exploring certain themes and then experiment with those same themes again in future works, with the belief that with each variation comes a new problem to be solved.[287]

Although the newness story just told captures the typical artistic context and typical audience member, the full story is more complicated. There are notable exceptions to the general rule that newness, but not too much, is psychologically desirable in the arts. Pertinently, some artistic fields emphasize trying to be very different from preceding artistic works. One example is jazz music, which underscores improvisation and ever increasing newness.[288] According to Keith Sawyer, although there are "rules about breaking the rules" in jazz, indicating order in the domain, "[t]he saliency of this tension between domain and innovation in jazz music, and the widespread awareness of its importance among the musicians, distinguish jazz from other . . . creative fields."[289] Moreover, even in artistic contexts where newness is less emphasized on average, there can be significant subsets of audience members—frequently other artists or art critics—that prefer a large degree of newness in the art they consume.[290]

Summing up, creativity in the artistic domains looks different than creativity in the scientific and engineering domains, particularly where invention is concerned. Creativity in making artistic inventions is distinguished by an emphasis on problem finding over problem solving and by individuals' general appreciation of some, but not too much, newness. This comparative summary of very different types of works—such as telephones and cubist paintings—is not meant to suggest that one should be comparing the newness of telephones to cubist paintings. These categories of works

[283] *E.g.*, PHILIP ROTH, THE GHOST WRITER (1979); PHILIP ROTH, PORTNOY'S COMPLAINT (1969).

[284] *E.g.*, Pablo Picasso, *Femme aux Bras Croisés* (1902).

[285] *E.g.*, Pablo Picasso, *Garçon à la Pipe* (1905).

[286] GETZELS & CSIKSZENTMIHALYI, *supra* note 117, at 178–80.

[287] *Id.* at 180.

[288] Keith Sawyer, *Improvisational Creativity: An Analysis of Jazz Performance*, 5 CREATIVITY RES. J. 253, 253, 259 (1992).

[289] *Id.* at 259.

[290] MARTINDALE, *supra* note 253, at 52.

might have different spectra of newness. Rather, it is meant to suggest that the degrees of newness for a type of work in relation to what previously exists in that field vary between the artistic domains and the scientific and engineering domains.

III. A PSYCHOLOGY OF INTELLECTUAL PROPERTY

This Part applies the psychological insights into creativity detailed in Part II to patent and copyright law, demonstrating how psychology mirrors the different protectability standards between the two legal paradigms. Whether or not the developers of these laws had similar psychological principles in mind in molding the protectability standards, they are remarkably aligned. This Part suggests that the difference in protectability is normatively correct, except when the patent and copyright laws must handle forms of creativity that differ from the prototypical forms that occur within their realm, for which they are not well structured. To the extent that it is desirable for intellectual property laws to stimulate these kinds of creativity, the laws should be adjusted to account for them.

With utilitarianism as the analytical base of intellectual property protection,[291] it is important to ask first whether people are creating copyrightable and patentable works to secure intellectual property protection. Evidence shows that creatively inclined individuals feel compelled to create, regardless of whether an intellectual property regime exists to protect their completed works.[292] Moreover, psychologists emphasize that "[p]eople will be most creative when they feel motivated primarily by the interest, enjoyment, satisfaction, and challenge of the work itself—not by external pressures."[293] Nonetheless, it is imperative to the utilitarian to provide intellectual property protection to creators of art or inventions. Even with sufficient personal resources to devote one's time and attention to artistic or scientific creation when the resulting work could be freely copied, the individual's work does not publicize and distribute itself. It is therefore essential that organizations and individuals provide creators with support for professional success by paying for, promoting, marketing, and distributing their works.[294] These vital institutional mechanisms will arise around

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[291] *See supra* text accompanying notes 106–09.

[292] *E.g.*, CSIKSZENTMIHALYI, *supra* note 115, at 107–26 (discussing how creative people love what they do and create for the state of flow it produces, rather than for money); *cf.* Sharon K. Sandeen, *The Value of Irrationality in the IP Equation*, *in* INTELLECTUAL PROPERTY LAW: ECONOMIC AND SOCIAL JUSTICE PERSPECTIVES 44 (Anne Flanagan & Maria Lillà Montagnani eds., 2010) (suggesting that in certain cases, creators have rational reasons not to seek intellectual property protection).

[293] Beth A. Hennessey & Teresa M. Amabile, *The Conditions of Creativity*, *in* THE NATURE OF CREATIVITY: CONTEMPORARY PSYCHOLOGICAL PERSPECTIVES, *supra* note 117, at 11.

[294] *See* Zimmerman, *supra* note 7, at 189–90 ("For [some], the function of the law is to structure a sector of the economy so that those who participate in the chain that stretches from the origination to the dissemination of expressive works—be they creative or purely informational, high authorship or low—can reap the rewards of their toil.").

creative people only if there is a proper economic motivation to them to do so, namely, the possibility of intellectual property protection to reward successful creativity by preventing the copying of the works they are supporting.[295]

As another preliminary issue, a number of important types of creativity in our culture that are protectable by intellectual property occur collaboratively, such as movie production, computer software development, and jazz music performance.[296] When creation is collaborative, the individualist notions described in Part II do not fit exactly.[297] Nonetheless, the individuals making up the collaboration still go through at least some of the four stages of creativity, and as a collective, they go through all four. Because of the initial complexities in understanding and shaping intellectual property protection based on the psychology of creativity, it is beyond the scope of this work to consider the full implications of collaboration for the laws of intellectual property.[298]

With these parameters, I now turn to considering how the psychological research on creativity accords with patent law, in section A, and copyright law, in section B. In section C, I discuss some classes of patentable works that do not seem to fit the prototypical form of scientific creativity and copyrightable works that do not seem to fit the prototypical form of artistic creativity and suggest how intellectual property laws might handle these ill-fitting works in light of the psychology of creativity.

A. Patent Law

Patent law, which requires novelty, nonobviousness, and utility to establish protectability, principally aligns with our understanding of how creativity proceeds and is valued in the realm of scientific and engineering inventions. In this section, I explore how patent law accords with this form of creativity's emphasis on problem solving and society's welcome of large degrees of newness.

1. Problem Solving.—Patent law principally protects scientific and engineering inventions. Patent law, with its high threshold of novelty, nonobviousness, and utility for protectability, is consistent with our understanding of creativity's role and value in the realm of science and engineering.

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[295] *Id. But cf.* Lydia Pallas Loren, *The Pope's Copyright? Aligning Incentives with Reality by Using Creative Motivation to Shape Copyright Protection*, 69 LA. L. REV. 1, 34–40 (2008) (maintaining that the typical motivation for creating a certain type of work ought to affect how much copyright protection to grant to works of that type, and that works created for non-monetary reasons or monetary reasons unrelated to the rights provided by copyright ought to receive less protection).

[296] SAWYER, *supra* note 103, at 119.

[297] *Id.*

[298] For a work exploring creativity and joint production of intellectual products, see Gregory N. Mandel, *Left-Brain Versus Right-Brain: Competing Conceptions of Creativity in Intellectual Property Law*, 44 U.C. DAVIS L. REV. 283 (2010).

The most valued component of creativity in this domain is how well an innovation solves a specific problem.[299] As such, patent law's protectability criteria focus on whether the problem solution is new, whether it is a significant leap forward in the field, and whether it works for a substantial and specific purpose.[300]

Recall that patent law's novelty requirement ensures that a particular invention has not been known or used before, with limited exceptions, under the justification that the valuable patent right ought not to be awarded to an invention of which society already has the benefit.[301] This requirement is in harmony with the emphasis in scientific creativity—particularly creativity exercised in making inventions—on solving problems. If society already has possession of a particular solution to a particular problem, a subsequently developed identical solution is not creatively valuable. Thus, there is no reason to give the patent incentive to any "Johnnies-invent-lately."

The statutory scheme for patent law's novelty standard and case law interpreting it solidifies its consistency with scientific creativity. Section 102 of the Patent Act attempts to identify the different ways in which preexisting solutions to a particular problem indicate that society already has the benefit of those solutions, rendering the later identical solution not novel.[302] First, it states that any earlier identical invention that was "patented or described in a printed publication in this or a foreign country" renders the later invention not novel.[303] Thus, a prior publication that is realistically available or disseminated to the public—typically by being published or indexed in an accessible library—destroys the novelty of the subsequent invention.[304] Written knowledge of a problem's solution disseminated in this way is considered to be beneficial to society and renders any later identical solutions not novel.

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[299] *See supra* Part II.B.2.a.

[300] *Cf.* J.H. McPherson, *A Proposal for Establishing Ultimate Criteria for Measuring Creative Output*, *in* SCIENTIFIC CREATIVITY: ITS RECOGNITION AND DEVELOPMENT, *supra* note 128, at 24–25 (suggesting, conversely, that scientific creativity may be measured by the number of patents an individual has).

[301] *See supra* text accompanying notes 28–31.

[302] *See* 35 U.S.C. § 102 (2006).

[303] *Id.* § 102(a).

[304] *See In re* Hall, 781 F.2d 897, 899–900 (Fed. Cir. 1986) (holding that one copy of a doctoral dissertation, properly indexed and placed in a German library, constitutes a printed publication because anyone could have access to it); Jockmus v. Leviton, 28 F.2d 812, 813–14 (2d Cir. 1928) (holding that a commercial catalog, distributed by a German firm to between 50 and 1000 French customers describing an adjustable lightbulb holder shaped like a candle, destroys the novelty of a later identical invention); Aluminum Co. of Am. v. Reynolds Metals Co., 14 U.S.P.Q.2d (BNA) 1170, 1172–73 (N.D. Ill. 1989) (holding that thirty-three progress letters sent to industry groups did not constitute printed publications, given that it was standard to treat these documents confidentially).

Second, section 102 indicates that if the preexisting solution was "known or used by others in this country," it is not patentable.[305] American society already has the benefit of the solution, and no patent can be granted on the later solution. Courts interpreting this provision usually require both knowledge and use of the earlier invention, underscoring that secret uses of the invention in the United States or mere clandestine knowledge is not enough to give American society the benefit of the solution. In such cases, a later identical solution is treated as novel.[306] Note the geographic limitation on this knowledge, which indicates congressional judgment that mere extraterritorial knowledge and use of an inventive solution to a problem will be unlikely to trickle back to benefit American society.[307] Section 102 also dictates that, for similar reasons, there is no novelty when, before invention, there already is a published or granted U.S. patent application[308] or another inventor made the same invention first and did not "abandon[], suppress[], or conceal[] it."[309]

Perhaps the aspect of novelty that best highlights how it is directed at problem solving is the doctrine of inherent anticipation. Although there have been many different judicial formulations of it, the doctrine provides that novelty is absent "even though the prior art did not expressly disclose what the patentee claims to have invented, [if] all or part of the patentee's invention was inherent in a particular piece of prior art."[310] Dan Burk and Mark Lemley read cases that invoke the inherent anticipation doctrine to find that an invention is inherently anticipated—and thus not novel—only when "the public already benefits from the invention, even if they don't know why."[311] As an example, one court upheld the validity of a patent on the chemical element americium (atomic number 95) in the face of a challenge that the claimed invention was inherently anticipated by the Fermi nuclear reactor, which in the course of operation would produce extremely minute amounts of americium as a byproduct.[312] The court reasoned that

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[305] 35 U.S.C. § 102(a).

[306] *See* Rosaire v. Baroid Sales Div., Nat'l Lead Co., 218 F.2d 72, 74–75 (5th Cir. 1955) (ruling that open work in a field using a method for determining where it is worth drilling an oil well based on the hydrocarbon content of rocks is sufficient use to destroy the novelty of a subsequent identical invention); Nat'l Tractor Pullers Ass'n v. Watkins, 205 U.S.P.Q. (BNA) 892, 901–02, 904–05, 911 (N.D. Ill. 1980) (holding that earlier drawings of a design for a tractor-pulling sled on a kitchen tablecloth, which are no longer in existence, do not destroy the novelty of a subsequent identical design, as the prior knowledge is not "reasonably accessible to the public").

[307] *But see* Margo A. Bagley, *Patently Unconstitutional: The Geographical Limitation on Prior Art in a Small World*, 87 MINN. L. REV. 679, 679–91 (2003) (exploring the contours of this limitation and questioning whether it makes sense in today's well-connected world).

[308] 35 U.S.C. § 102(e) (excepting certain situations).

[309] *Id.* § 102(g).

[310] Dan L. Burk & Mark A. Lemley, *Inherency*, 47 WM. & MARY L. REV. 371, 372 (2005) (discussing the different cases).

[311] *Id.* at 374.

[312] *In re* Seaborg, 328 F.2d 996, 996–97 (C.C.P.A. 1964).

the public had not had the benefit of the reactor's production of americium, as it was "completely undetectable, since it would have been diluted with the 40 tons of intensely radioactive uranium fuel which made up the reactor."[313] In cases like this one, a problem has been solved to society's benefit even if no one has yet explained why.

The ultimate point of section 102's novelty-destroying provisions is that unless American society actually seems to have a reasonably good chance of benefiting from a preexisting solution to a problem, it is as if the solution does not exist. The novelty provisions of patent law thus accentuate how much societal possession of the benefit of a particular solution matters in patent law. This principle is very much in line with the psychological understanding of scientific creativity and fundamentally different than copyright law and the understanding of artistic creativity.

Patent law's nonobviousness requirement also emphasizes the value of problem solution to creativity for scientific and engineering inventions.[314] Section 103 of the Patent Act removes from patentability any problem solution that would have been obvious to a person having ordinary skill in the art based on the preexisting state of the art.[315] In so doing, patent law signifies that problem solutions that can be derived with at best a minimally creative process—possibly even absent certain steps, such as incubation[316]—are not valuable. It is as if society already has those solutions available by virtue of having both its preexisting scientific and engineering knowledge and people having ordinary skill in the art to take direct advantage of that knowledge. The Supreme Court's recent revival of the obvious-to-try doc-

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[313] *Id.* at 999 (internal quotation marks omitted).

[314] *Cf.* Sawyer, *supra* note 11, at 473 (indicating that the Supreme Court's decisions on nonobviousness "clearly imply a problem solving model"). Unsurprisingly, in light of the discussion above on creativity, *supra* text accompanying notes 203–06, a small line of cases holds that the finding of a really good problem can make an invention nonobvious, even if the solution is readily apparent once the problem has been found. *E.g.*, *In re* Kaslow, 707 F.2d 1366, 1373 (Fed. Cir. 1983) (analyzing the appellant's argument that problem finding fulfills the obviousness requirement); *In re* Sponnoble, 405 F.2d 578, 585 (C.C.P.A. 1969) ("[A] patentable invention may lie in the discovery of the source of a problem even though the remedy may be obvious once the source of the problem is identified. This is *part* of the 'subject matter as a whole' which should always be considered in determining the obviousness of an invention. . . ."). This rule is very rarely invoked, and it is unclear whether it remains good law after the Supreme Court's recent decision making nonobviousness harder to find. *See* KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398 (2007); *cf.* Sawyer, *supra* note 11, at 474–77 (indicating that the Supreme Court's nonobviousness jurisprudence is focused on making sure that the problem solution was not obvious and not on how nonobvious the problem finding was). The potential availability of this rule does not undermine the importance of problem solving in patent law but merely indicates that perhaps in very rare cases, problem finding could carry the day.

[315] *See supra* text accompanying notes 32–39. *See generally* Graham v. John Deere Co., 383 U.S. 1, 5–19 (1966) (establishing the framework by which to evaluate nonobviousness).

[316] *Cf. infra* text accompanying notes 361–64(demonstrating how copyright's merger doctrine might similarly be an application of the notion that the absence of certain steps of the creativity process indicates that there ought to be no intellectual property protection).

trine reflects as much. In *KSR International Co. v. Teleflex Inc.*,[317] the Court reasoned that:

> When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under § 103.[318]

By contrast, when there are signs that a problem solution was not obvious because those with prior knowledge in the art were skeptical about the possibility of the solution[319] or there had been a long-felt need for the solution,[320] society values the creativity that produced the solution.

That said, nonobviousness does not require an invention to be an improvement over the prior art. Although there must be sufficient distance between the invention and the prior art, patent law does not measure the direction of this distance—that is, whether the invention is an improvement, a setback, or neither. In that sense, nonobviousness on its own is not a measure of whether an invention solved a problem useful to society.

It is here that the third requirement for patentability, utility, comes in. Utility is tightly linked to the emphasis in scientific creativity on problem solving, particularly in measuring whether a solution is valuable to society. Utility requires that an invention be operable and, moreover, that it work for a specific and substantial purpose.[321] On this basis, a machine claiming to create perpetual motion—a scientific impossibility—cannot be patented, as it is inoperable.[322] In cases of inoperability, what is presented as a problem solution is in fact no solution at all, even if underlying the invention is a significant found problem, such as creating perpetual motion. With inoperable inventions, then, the scientific creativity is insufficient, and thus they are not patentable.

Now consider an invention with no known use at the time of patent application. According to patent law, it has no specific utility and therefore

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[317] 550 U.S. 398.

[318] *Id.* at 421.

[319] *See* Arkie Lures, Inc. v. Gene Larew Tackle, Inc., 119 F.3d 953, 955–58 (Fed. Cir. 1997).

[320] *See* Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1379–80 (Fed. Cir. 1986).

[321] *E.g.*, *In re* Fisher, 421 F.3d 1365, 1371 (Fed. Cir. 2005) (requiring there to be both substantial utility, "a significant and presently available benefit to the public," and specific utility, "a well-defined and particular benefit to the public"); *see supra* text accompanying notes 40–44.

[322] *In re* Swartz, 232 F.3d 862, 863–64 (Fed. Cir. 2000) (per curiam). *But see* Daniel C. Rislove, Comment, *A Case Study of Inoperable Inventions: Why Is the USPTO Patenting Pseudoscience?*, 2006 WIS. L. REV. 1275, 1276–78 (criticizing the U.S. Patent and Trademark Office for granting patents on inoperable inventions, such as methods of controlling appliances only with the mind and an antigravity spaceship).

cannot be patented.[323] In *Brenner v. Manson*,[324] the Supreme Court's landmark case on specific utility, the Court rejected a patent application on a process producing a steroid of no known use at the time of the patent application even though the steroid very likely had a specific use because similar steroids inhibited tumors in mice.[325] In cases such as *Brenner* involving an invention that lacks a specific utility, the invention cannot be a problem solution for the reason that no problem has been found to be identified as being solved.[326]

Relatedly, when an inventor creates and patents a product or process with one specific purpose in mind—depending on the breadth of its patent claims—a person (including the initial inventor) who later puts that same product to another purpose—a new problem solution—can seek a patent on the new solution.[327] For example, in the 1980s and 1990s, scientists at Pfizer were working on a drug to treat high blood pressure and produced the compound sildenafil citrate, which Pfizer patented.[328] In trials, Pfizer scientists realized that this compound caused penile erections and could be used to treat impotence.[329] It then marketed the drug quite profitably as Viagra.[330] Pfizer, therefore, could and did seek another patent on the compound's new use.[331] This aspect of patent law also underscores the value of problem solving in patent law, following from its emphasis in scientific creativity.

In sum, patent law's three protectability conditions—novelty, nonobviousness, and utility—ensure protectability for scientific and engineering inventions that emphasize problem solving, the crucial component of creativity in the scientific and engineering domains, particularly where invention is concerned. With this analysis, I now turn to the other distinction

[323] *E.g.*, Brenner v. Manson, 383 U.S. 519, 534–35 (1966).

[324] *Id.*

[325] *Id.*

[326] This situation is distinct from serendipitous discoveries, in which the use to which something can be put is not the reason for which it was created. Sean B. Seymore, *Serendipity*, 88 N.C. L. REV. 185, 188–90 (2009). Important examples of such discoveries are Teflon, nylon, and super glue. *Id.* at 188–89. Serendipitous discoveries are patentable, so long as the three protectability criteria are met, including that there be a specific utility for the discovery. *Id.* at 190 & n.23. Even though the discovery was serendipitous, the discoverer must recognize the value of the discovery, thereby discerning a problem and its solution all at once. *See id.* at 192–94 (elaborating on Louis Pasteur's assertion that chance favors the prepared mind); *see also* RUNCO, *supra* note 116, at 285. This recognition can happen only if the discoverer possesses sufficient knowledge about the domain. *See supra* text accompanying notes 124–28. Recognition of the value upon discovery does not short-circuit the creative process but merely truncates it. RUNCO, *supra* note 116, at 285.

[327] Richard A. Castellano, Note, *Patent Law for New Medical Uses of Known Compounds and Pfizer's Viagra Patent*, 46 IDEA 283, 294 (2006).

[328] *Id.* at 285–87 & n.23 (citing Pyrazolopyrimidinone Antianginal Agents, U.S. Patent No. 5,250,534 (filed May 14, 1992)).

[329] *Id.* at 287–88.

[330] *Id.* at 288.

[331] *Id.*

for creativity in scientific and engineering domains: that individuals will tolerate or are happy to have a large degree of newness with respect to inventions.

2. Large Degrees of Newness.—In addition to the emphasis on problem solving in creativity for scientific and engineering inventions, society tolerates and frequently celebrates huge leaps of newness in these domains.[332] Patent law's protectability standards align with this tolerance and celebration by offering the patent reward to inventors only when they make sufficiently new leaps forward in their respective domains. Two aspects of protectability in patent law, novelty and nonobviousness, coupled with the application of the doctrine of equivalents, encourage a large degree of newness in scientific and engineering invention. Patent law's standards thereby align with its purpose of "promot[ing] the Progress of . . . useful Arts,"[333] by understanding progress as how members of society tend to value it.

As discussed above, the novelty requirement ensures that no one else already contributed the particular problem solution.[334] As such, the requirement gives the incentive to scientists and engineers to direct their creativity toward new solutions for problems.

The novelty requirement alone might lead scientists and engineers to create inventions that differ in insignificant ways from the prior art. The novelty requirement is not, however, the only doctrine of patent law that affects the degree of newness in inventions. The doctrine of equivalents serves to ensure that there is more than a minimal degree of newness in inventions. Per the doctrine of equivalents, a patentee can "claim those insubstantial alterations that were not captured in drafting the original patent claim but which could be created through trivial changes,"[335] so long as they do not intrude on the prior art.[336] Equivalents are determined flexibly with reference to the following:

> the purpose for which a [claim element] is used in a patent, the qualities it has when combined with the other [elements], . . . the function which it is intended to perform[, and] whether persons reasonably skilled in the art would have known of the interchangeability of an [element] not contained in the patent with one that was.[337]

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[332] *See supra* Part II.B.2.b.

[333] U.S. CONST. art. I, § 8, cl. 8.

[334] *See supra* text accompanying notes 303–09.

[335] Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 733 (2002).

[336] Stumbo v. Eastman Outdoors, Inc., 508 F.3d 1358, 1361 (Fed. Cir. 2007).

[337] Graver Tank & Mfg. Co. v. Linde Air Prods. Co., 339 U.S. 605, 609 (1950); *see also* John R. Allison & Mark A. Lemley, *The (Unnoticed) Demise of the Doctrine of Equivalents*, 59 STAN. L. REV. 955, 959 (2007) (describing the different formulations of the equivalence test that courts use).

Although the application of the doctrine of equivalents has been constrained in recent years,[338] it still encourages inventors to inject more newness into their creations. Minimal changes by an inventor to an already patented invention will likely fall within the doctrine of equivalents for the patented invention, destroying any novelty the newer invention might otherwise have. Therefore, inventors must make more than minimal changes to prior art that is patented so that they satisfy the novelty requirement coupled with the effect of the doctrine of equivalents.[339]

While these two forms of newness that patent law encourages—novelty and the effect of the doctrine of equivalents—are not inconsequential, neither do they have the biggest impact on inventors. Within patent law, what pushes inventors to large degrees of newness, giving scientists and engineers incentive to shatter convention and create groundbreaking inventions, is patent law's nonobviousness requirement. As discussed above, it guarantees that a patent will not be granted for an invention unless there is a significant leap beyond already existing solutions to a problem.[340] In fact, a unanimous Supreme Court recently sought in *KSR International Co. v. Teleflex Inc.*[341] to assure that the doctrine of nonobviousness has teeth. In establishing the framework to answer "whether a patent claiming the combination of elements of prior art is obvious,"[342] the Court emphasized the need to articulate the nonobviousness criterion with enough flexibility to guarantee that patents are issued only to inventions constituting a sufficient advance in the state of the art, thereby encouraging leaps in innovation.[343] Justice Kennedy, the author of *KSR*, elaborated:

> We build and create by bringing to the tangible and palpable reality around us new works based on instinct, simple logic, ordinary inferences, extraordinary ideas, and sometimes even genius. These advances, once part of our shared knowledge, define a new threshold from which innovation starts once more. And as progress beginning from higher levels of achievement is expected in the normal course, the results of ordinary innovation are not the subject of ex-

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[338] Fromer, *supra* note 2, at 737–38 (describing three ways in which the doctrine has been constricted).

[339] *But cf.* Timothy R. Holbrook, *Equivalency and Patent Law's Possession Paradox*, 23 HARV. J.L. & TECH. 1, 15–31 (2009) (describing how the doctrine currently covers not all equivalents, but just those that could not have been in the inventor's possession at the time of patenting, principally after-developed equivalents). Because novelty is measured as of the time of a patent application and the doctrine of equivalents is assessed as of the time of infringement, Mark A. Lemley, *The Changing Meaning of Patent Claim Terms*, 104 MICH. L. REV. 101, 105–06, 108–10 (2005), an inventor might be able to secure a patent, which at the time of filing is novel and nonobvious, but whose novelty or nonobviousness is put in doubt at some later point by the doctrine of equivalents, Holbrook, *supra*, at 16–21.

[340] *See supra* text accompanying notes 315–20.

[341] 550 U.S. 398 (2007).

[342] *Id.* at 417.

[343] *Id.* at 415, 427.

> clusive rights under the patent laws. Were it otherwise patents might stifle, rather than promote, the progress of useful arts.[344]

The nonobviousness requirement accordingly alerts scientists and engineers that grand leaps in newness ought to be a crucial goal for their innovation should they wish to secure patent rights on their inventions. Consequently, nonobviousness complements the large degree of newness that society frequently values in creativity in scientific and engineering invention.

In sum, this section shows that patent law seems to align with the psychology of scientific creativity by setting its standards for protectability—novelty, nonobviousness, and utility—in a way that encourages scientific creativity. There are, however, certain classes of patentable works that differ in significant ways from the scientific and engineering inventions described in the preceding discussion of creativity. After discussing how copyright law's standard for protectability is consistent with the psychology of artistic creativity in the next section, I address the treatment of such ill-fitting works within the intellectual property legal paradigm.

B. Copyright Law

Copyright law, with its standard of originality for protectability, principally aligns with our understanding of how creativity proceeds and is valued in the artistic realm. In this section, I explore how the emphasis on problem finding and individuals' preferences for artistic works that are new, but not too new, manifests in copyright law. These two aspects of artistic creativity are quite different from the characterization of creativity for scientific and engineering inventions, which helps explain why the protectability standard of patent law is different from that of copyright law.

1. Problem Finding.—Copyright law, in the main, provides protection for works that are artistic, such as literature, paintings, and music. In both of its components—independent creation and a modicum of originality[345]—copyright's standard of originality highlights problem finding, the more valued component of creativity in the arts. Recall that problem finding is about an author identifying subjective emotional themes or ideas to transform into artistic expression.[346] With regard, then, to the requirement of independent creation, the emphasis is on the personal discovery of a subjective problem that artists express in their work. Justice Holmes recognized as much in one of the Supreme Court's most notable copyright decisions, *Bleistein v. Donaldson Lithographing Co.*[347] In holding a color poster advertising a circus to be copyrightable,[348] Justice Holmes wrote that crea-

[344] *Id.* at 427.

[345] *Supra* Part I.B.

[346] *Supra* Part II.B.3.a; *cf.* Hughes, *supra* note 103, at 106–08 (noting the "connection between creativity and personal experience").

[347] 188 U.S. 239 (1902).

[348] *Id.* at 251.

tion of an artistic work "is the personal reaction of an individual upon nature. Personality always contains something unique. It expresses its singularity even in handwriting, and a very modest grade of art has in it something irreducible, which is one man's alone. That something he may copyright . . . ."[349]

The emphasis on problem finding in artistic creativity helps explain why it is that Judge Learned Hand's hypothetically (though improbably) identical and subsequent version of Keats's *Ode on a Grecian Urn* receives copyright protection, even though Keats's version—an identical problem solution—is already a part of the cultural fabric. Because problem finding is integral to artistic creativity, copyright law places a greater value on rewarding authors for using their pen to convert their valuable emotional and subjective concepts into an artistic product than on making sure only one problem solution receives the prize of copyright.[350] Relatedly, independently created artistic works appropriating the works of others, such as those of Jeff Koons,[351] can nonetheless contain sufficient problem finding to be deemed creative.[352]

The emphasis on problem finding also both helps demarcate more precisely what the Supreme Court's *Feist* decision meant by a modicum of creativity and explain why *Feist* imposed this requirement. Creativity's legal meaning is imprecise.[353] *Feist* did not say much more than that the requisite modicum of creativity is evidenced by "intellectual production, . . .

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[349] *Id.* at 250; *accord* Alfred Bell & Co. v. Catalda Fine Arts, Inc., 74 F. Supp. 973, 975 (S.D.N.Y. 1947) ("The work of the engraver upon the plate requires the individual conception, judgment and execution by the engraver on the depth and shape of the depressions in the plate to be made by the scraping process in order to produce in this other medium the engraver's concept of the effect of the oil painting. No two engravers can produce identical interpretations of the same oil painting."), *aff'd*, 191 F.2d 99 (2d Cir. 1951).

[350] There are, nonetheless, different reasons to question whether independently created works that are substantially similar to existing works ought to receive copyright protection. *See* Fromer, *supra* note 2, at 754–55.

[351] *E.g.*, Blanch v. Koons, 467 F.3d 244 (2d Cir. 2006). *See generally* Jeff Koons, http://www.jeffkoons.com (last visited June 20, 2010) (furnishing additional information on the Neo-Pop artwork of Jeff Koons).

[352] *Cf.* Hughes, *supra* note 103, at 127 (arguing that an appropriation artist might be "trying to *recapture* and *reconvey* his own personal expression"). Relatedly, works created at least partially through a process other than an artist's conscious will might involve sufficient problem finding of the sort expected of artistic creativity. For example, a painting in which the artist chooses the color and position of each paint drop by a roll of dice, would likely involve problem finding (as the author might be exploring personal themes of randomness), just as Marcel Duchamp's found objects could be a form of problem finding even if he did not create them. *Cf.* Alan L. Durham, *The Random Muse: Authorship and Indeterminacy*, 44 WM. & MARY L. REV. 569, 596–607, 623–41 (2002) (exploring whether these sorts of works are authored and qualify for copyright).

[353] Zimmerman, *supra* note 7, at 209 (noting that *Feist* "does not even make clear whether originality is to be found by looking at the work itself, or instead by evaluating the mental processes that went into producing it").

thought, and conception."[354] A sharper and more suitable definition might sensibly look to the psychology of creativity in the artistic realm. A modicum of creativity would then mean that the resulting product came about through the creator's passing through the four stages of creativity and that there was at least some minimal problem finding of the artistic sort leading to the finished product.[355]

In this vein, it is comprehensible why the telephone book at issue in *Feist* did not qualify for copyright protection due to its lack of originality.[356] While the creation of the telephone book might have passed through the four stages of the creative process, the problem finding that occurred was not of the type that characterizes artistic creativity. The authors found no component subjective or emotional problem that they carried through to the final product.[357] The authors merely collected structured factual information and found the most functional way to display it in a telephone directory. Dennis Karjala correctly recognizes that the type of creativity that occurred in *Feist* is, if anything, about the functional result obtained.[358] Reframing that in terms of creativity, Karjala's observation seems to suggest that if any valuable creativity occurred in creating the telephone book, it was about problem solving in the scientific and engineering sense, something that copyright law, focused on artistic creativity, does not emphasize. Compare the telephone book with a photograph of Oscar Wilde that the Court held to be copyrightable because it was made

> entirely from [the photographer's] own original mental conception, to which he gave visible form by posing the said Oscar Wilde in front of the camera, selecting and arranging the costume, draperies, and other various accessories in said photograph, arranging the subject so as to present graceful outlines, arranging and disposing the light and shade, suggesting and evoking the desired expression . . . .[359]

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[354] Feist Pubs., Inc. v. Rural Tel. Serv. Co., 499 U.S. 340, 347 (1991).

[355] *See supra* Parts II.B.1, II.B.3.a. The original American copyright law protected a limited set of works, including maps. *See supra* note 45. Whatever the original basis for maps' protection under copyright law, maps might seem to be an odd fit in a psychological understanding of copyright law. Intuitively, they do not seem prototypical of art, but rather seem to be about providing people with accurate geographical information, which would seem to be about problem solving. Scholars of cartography think, however, that maps are in part like art. As one scholar puts it, maps "inform us about the cosmological beliefs of the people who made them, as much as they do about geophysical reality. Maps are also representations of social and political aspiration and power, making statements about the ownership and control of territory." Jeremy Black, *Introduction* to 100 MAPS: THE SCIENCE, ART AND POLITICS OF CARTOGRAPHY THROUGHOUT HISTORY 6, 6 (John O.E. Clark ed., 2005).

[356] *See supra* text accompanying notes 54–61.

[357] *Cf.* Howard B. Abrams, *Originality and Creativity in Copyright Law*, 55 LAW & CONTEMP. PROBS. 3, 17 (1992) (reading *Feist* as "insisting that there must be some injection of independent aesthetic or artistic judgment in the decisions concerning the selection, coordination, or arrangement of the facts in a compilation for it to possess the requisite 'minimum level' of creativity").

[358] Karjala, *supra* note 10, at 468–517.

[359] Burrow-Giles Lithographic Co. v. Sarony, 111 U.S. 53, 54–55 (1884).

The Supreme Court's focus is on the creative problem finding aspects of taking a photograph, leading to the problem solution of the photograph itself.

It is far from clear that there was sufficient creativity in the production of the telephone book. Copyright protection does not extend to ideas, but only to expressions of ideas.[360] The merger doctrine states that there can be no copyright protection for an expression that merges with its idea, in the sense that there are only very few ways to express the idea.[361] Were copyright protection granted in those cases, it would be akin to granting copyright on the corresponding idea.[362] As the idea for the telephone directory merged with its expression—given that it is natural, if not inevitable, to present local telephone listings alphabetically—there could be no copyright protection.[363] An investigation of the creativity process suggests that when the discovered problem in effect leads directly and obviously to very few particular solutions, incubation is almost certainly absent, as there is nothing to incubate.[364] In such cases, then, creativity is wanting, and an understandable utilitarian reaction is that there is insufficient reason to grant copyright protection as an incentive.

Some courts have required a heightened standard of originality for works derivative of a preexisting artistic work.[365] Although it has recently thrown some of its analysis into question,[366] the Seventh Circuit has explained that the heightened standard ensures that subsequent artistic creators will not be faced with unwarranted copyright infringement of the derivative work if they use the substantially similar, preexisting work.[367] Because the analysis above demonstrates that the originality standard is focused on rewarding problem finding, a heightened originality standard then looks for problem finding beyond that in the preexisting work. It thus suggests not only that there be an onward march of newness as more artistic works are created but also that finding new problems is key to creating protectable derivative works.[368]

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[360] *See* Thomas F. Cotter, *Fair Use and Copyright Overenforcement*, 93 IOWA L. REV. 1271, 1298 n.74 (2008) (citing Educ. Testing Servs. v. Katzman, 793 F.2d 533, 539 (3d Cir. 1986)).

[361] *Id.*

[362] *Id.*

[363] Feist Pubs., Inc. v. Rural Tel. Serv. Co., 499 U.S. 340, 349 (1991).

[364] *See supra* text accompanying notes 239–45.

[365] *E.g.*, Entm't Research Group, Inc. v. Genesis Creative Group, Inc., 122 F.3d 1211, 1218–20 (9th Cir. 1997); Gracen v. Bradford Exch., 698 F.2d 300, 305 (7th Cir. 1983); Durham Indus., Inc. v. Tomy Corp., 630 F.2d 905, 909–11 (2d Cir. 1980).

[366] *See* Schrock v. Learning Curve Int'l, Inc., 586 F.3d 513, 516 (7th Cir. 2009) (clarifying that *Gracen* "should not be understood to require a heightened standard of originality for copyright in a derivative work").

[367] *Gracen*, 698 F.2d at 304–05.

[368] Copyright law's treatment of derivative works, however, does not fully seem to fit in with this scheme. The statute provides that "protection for a work employing preexisting material in which copyright subsists does not extend to any part of the work in which such material has been used unlawfully."

The useful-article doctrine in copyright law goes beyond these requirements to exclude from protectability those works that might walk and talk like copyrightable material but ought not to be copyrighted. The doctrine dictates that even a sufficiently original work might not be protectable under copyright if it is "an article having an intrinsic utilitarian function that is not merely to portray the appearance of the article or to convey information."[369] Thus, works primarily concerned with providing a patent-like solution to a problem—such as clothing, which functions to fit the human body for warmth and cover—cannot be copyrighted.[370]

Speaking of problem solving, this section's analysis of copyright has not focused on problem solving thus far, which is not insignificant even if deemphasized in artistic creativity. Copyright law protects the resulting expression of artistic creativity, which is the problem solution. The fact that expression and not idea is protected would seem to make copyright about valuing the particular problem solution in artistic works. However, restricting protection to expression also demonstrates a commitment to protecting artists' problem finding. If copyright law were to protect ideas, which are tightly linked to problem finding, other artists would be prohibited from engaging in problem finding with regard to those ideas which had already been exhibited in particular expression. Because problem finding is so personal and subjective, copyright law allows artists to rediscover problems others may have already found and solved.

Copyright law's emphasis in its protectability standard on problem finding[371] looks quite distinct from patent law's emphasis on problem solving. These differences reflect those that are found between creativity in the artistic domains and in the scientific and engineering domains, respectively. In this way, copyright law and patent law each strives to grant an incentive to the prototypical creators within its purview to make works that are creatively valuable in its domain, thus reflecting the differences between scientific and artistic creativity.

2. *Not Too Much Newness*.—In addition to the emphasis on problem finding in artistic creativity, individuals psychologically prefer that works

17 U.S.C. § 103(a) (2006). That is, even if one finds one's own problem to build atop a preexisting work of another, copyright law will not provide protection. *See* Anderson v. Stallone, No. 87-0592 WDKGX, 1989 WL 206431, at *8–11 (C.D. Cal. Apr. 25, 1989). This provision, then, does not fit naturally within this psychological account. Rather, it seems to be directed at stopping people from free riding on others' found problems. In fact, a number of commentators argue in favor of eliminating this rule to provide more protection for improvers in copyright law. *E.g.*, Wendy J. Gordon, *Toward a Jurisprudence of Benefits: The Norms of Copyright and the Problem of Private Censorship*, 57 U. CHI. L. REV. 1009, 1019–20 (1990); Lemley, *supra* note 27, at 1074–77.

[369] 17 U.S.C. § 101 (excepting from this exclusion any "design incorporat[ing] pictorial, graphic, or sculptural features that can be identified separately from, and are capable of existing independently of, the utilitarian aspects of the article").

[370] Brandir Int'l, Inc. v. Cascade Pac. Lumber Co., 834 F.2d 1142, 1142–44 (2d Cir. 1987).

[371] *Cf.* Ginsburg, *supra* note 72, at 1881–88 (tracing the historical view that authors' personalities are imbued in their work).

be new, but not too new,[372] something they frequently desire for scientific and engineering inventions. An intermediate level of predictability is ideal for individual preferences.[373] Copyright's requisite low threshold of originality accords with this valuation of newness in artistic creativity.

Recall that, although there are limits, not much is required for a work to qualify for copyright; it need only be independently created and possess a modicum of creativity.[374] By imposing a minimal standard of originality, the law signals to potential creators in the arts that it is not necessary to expend efforts to be highly original.[375] In fact, it is perfectly rational for them not to inject too much originality into their works because they can get valuable copyright protection without it.[376]

In light of the psychological research demonstrating that people like increasing newness in artistic works, but only up to a certain point, after which they strongly dislike such works, copyright law sensibly does not attempt to give artists the incentive to create works that are too new. Artists are encouraged to create works that have some intermediate degree of newness, which will appeal to the society seeking to encourage artistic creativity in the first place. Copyright's minimal standard thereby aligns with copyright law's purpose of "promot[ing] the Progress of Science," by understanding progress as typical members of society tend to value it.[377]

If copyright were to impose too high of a standard and artists were to react by creating works with much more newness, the psychological research on the arousal theory suggests that typical individuals would tend not to like these works.[378] The psychological understanding that too much new-

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[372] *See supra* Part II.B.3.b.

[373] *See supra* Part II.B.3.b.

[374] *See supra* Part I.B.

[375] Harrison, *supra* note 62, at 857–58; Parchomovsky & Stein, *supra* note 19, at 1517.

[376] Parchomovsky & Stein, *supra* note 19, at 1517. *See generally* Thomas S. Ulen, *Rational Choice and the Economic Analysis of Law*, 19 LAW & SOC. INQUIRY 487 (1994) (addressing how laws should be structured to induce people to act rationally).

[377] U.S. CONST. art. I, § 8, cl. 8. Courts recognize broader copyright protection for works evincing greater degrees of creativity. *E.g.*, Warren Publ'g, Inc. v. Microdos Data Corp., 115 F.3d 1509, 1515 n.16 (11th Cir. 1997) (en banc). It is unclear whether what is being measured in degrees is the problem found, the problem solved, or something else. If at least in part the problem solved, this sliding scale would seem to be a way to give an incentive to produce ever newer works, something a psychological explanation would not typically encourage beyond a certain point.

[378] Notwithstanding copyright law's low threshold for newness and its concomitant incentive for artists not to be too new, this does not mean that highly new works are not protected. For example, the cubist paintings of Pablo Picasso and George Braques, in which they would represent all of the surfaces of an object in a single plane, were wildly new compared to the art that came before. *See generally* ANNE GANTEFÜHRER-TRIER, CUBISM (2004) (describing the cubist movement). They were surely copyrightable. Given that psychological research suggests that people do not like too much newness in artistic works, why protect very new works in the first place? The probable answer is that, sometimes, very new works will be enjoyed by some non-negligible segment of society, as cubism was. Moreover, as time passes and society expects ever higher degrees of newness from artistic works, *supra* text accompanying notes 275–82, it is likely that very new works, like cubist paintings, will come to be appreci-

ness is not a good thing for artistic works flies in the face of recent proposals by multiple legal scholars that copyright law ought to provide incentive for artists to create works with ever more originality. Gideon Parchomovsky and Alex Stein propose that the scope of copyright protection ought to be calibrated to the degree of originality in the work: the more originality, the more protection.[379] Joseph Scott Miller argues that copyright law ought to be structured to "encourag[e] those who experiment with expression to push against, and even break past, the norms and conventions of routine expression that dominate a given genre at a given time."[380] Miller would inject a nonobviousness-like standard into copyright law.[381] In light of the psychological preference for some, but not too much, newness with regard to artistic creativity, these scholars are wrong to assume that the more newness artists injects into their work, the better off society is.

In its structure, then, copyright law's protectability standard does not look like the standard of patent law. Copyright law aims to harvest artistic creativity involving a lower degree of newness because that is the sort of artistic creativity that most in society tend to crave. In contrast, patent law seeks to foster creativity involving a much larger degree of newness because society values that for scientific and engineering inventions. Add to that the different foci of copyright law on problem finding and patent law on problem solving, and the two forms of intellectual property law have quite different, but explicable, standards for protectability.[382]

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ated. Given the lengthy duration of copyright, 17 U.S.C. § 302(a) (2006) (stating that a copyright "endures for a term consisting of the life of the author and 70 years after the author's death"), this appreciation would be likely to occur during the copyright's lifespan. Therefore, copyright law would be remiss to set a ceiling on the permissible newness in a work of art. Nonetheless, the reason we characterize certain artistic works as very new is typically due to their style, as in cubism. Copyright law does not protect that style, so others can make artwork in the cubist style. *Cf. supra* text accompanying notes 367–71(suggesting that copyright law's protection of expression, while seemingly only about problem solving, also in large part values the problem finding that later artists can do).

[379] Parchomovsky & Stein, *supra* note 19, at 1507 ("Under our proposed design, authors of highly original works will not only receive greater protection, but will also be sheltered from liability if sued for infringement by owners of preexisting works. Conversely, creators of minimally original works will receive little protection and incur greater exposure to liability if sued by others."). Parchomovsky and Stein propose three mechanisms to accomplish this calibration: a "doctrine of inequivalents" to shelter highly original works from infringing the works of others, an "added value doctrine" to make infringement remedies dependent on whether the infringing or initial work has more originality, and a "sameness rule" creating a presumption of copying when minimally original works accused of infringement are substantively similar to the initial work. *Id.* at 1523–49.

[380] Miller, *supra* note 19, at 463–64.

[381] *Id.* at 464.

[382] *Cf.* Karjala, *supra* note 10, at 524 ("*Information* is the subject matter of copyright—works that have no function other than to inform, entertain, or present an appearance to human beings. Function is the subject matter of patent—works that do have a function beyond informing, entertaining, or presenting an appearance to human beings, including methodologies for gathering, organizing, and presenting information accurately and efficiently.").

The differing scopes of protection afforded by copyright and patent law, which are considered to be linked to the protectability standards' permissiveness or strictness,[383] has been undertheorized in the academic literature.[384] Protectability standards in intellectual property law communicate to potential creators that certain classes of works are of value and ought to be produced and protected. The standards therefore ought to be calibrated as accurately as possible to cover works considered to be creatively valuable, as the psychology of intellectual property described heretofore suggests. Only once these protectability standards are established does it make sense to ascertain the scope of rights for those works.

A psychological theory of intellectual property calls into question the validity of some of the earlier theories[385] rationalizing the distinct protectability standards of copyright law and patent law and offers a complementary explanation to the other theories of the dissimilar protectability standards. A psychological theory, such as the one described above, disputes aspects of the learning theory and synthesizes the results, judgment, and indexing theories.

A psychology of intellectual property shows that the learning theory—attributing protectability's differing standards to the position that artists do not need to learn about prior artistic works to create wonderful artistic works, while scientists and engineers do[386]—is not fully correct. As demonstrated above, artists, scientists, and engineers typically—although not always—need to spend substantial amounts of time learning that which came before them to be able to create in their particular domain.[387]

A psychology of intellectual property also complements the demand-side account embedded in Paul Goldstein's results theory, with its idea that copyright law seeks to encourage the production of numerous artistic works while patent law aims for the production of efficient scientific and technological works.[388] A psychology of intellectual property provides a supply-side version of Goldstein's theory. Artistic creativity—and its encouragement in copyright law—values problem finding and some, but not too much, newness, thereby leading to the production of a greater number of ar-

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[383] *See supra* text accompanying notes 77–79.

[384] *See supra* note 6 and accompanying text.

[385] *See supra* Part I.C.

[386] *See supra* text accompanying notes 93–99.

[387] *See supra* text accompanying notes 124–28; *accord* Emerson v. Davies, 8 F. Cas. 615, 619 (C.C.D. Mass. 1845) (No. 4436) (Story, J.) ("Every book in literature, science and art, borrows, and must necessarily borrow, and use much which was well known and used before . . . . No man writes exclusively from his own thoughts, unaided and uninstructed by the thoughts of others. The thoughts of every man are, more or less, a combination of what other men have thought and expressed, although they may be modified, exalted, or improved by his own genius or reflection."); Litman, *supra* note 68, at 966–67 ("[T]he very act of authorship in any medium is more akin to translation and recombination than it is to creating Aphrodite from the foam of the sea.").

[388] *See supra* text accompanying notes 81–83.

tistic works. Problem finding is personal and emotionally grounded in the arts, and on whole this process of discovery leads to distinct solutions by different artists even when the underlying problems are similar. Moreover, because some, but not too much, newness is psychologically desirable for artistic works, society seeks to encourage the creation of more copyrightable material as gradual steps are taken toward increasing degrees of newness. Therefore, copyright law encourages the creation of a vast number of artistic works. By contrast, scientific creativity—and its encouragement in patent law—values problem solving and a larger degree of newness. As more problems will be found than solved, fewer, but more productive, inventions in science and engineering can be patented. Additionally, because society accepts and often desires a large degree of newness for scientific and engineering inventions, fewer works of science and engineering will be patented. For these reasons, patent law stimulates the creation of fewer, but efficient, scientific and engineering inventions.

A psychology of intellectual property also enriches the judgment theory, with its idea that people feel ill equipped to judge artistic works objectively and thus want to avoid doing so in copyright law, but they feel comfortable judging scientific works objectively and are at ease making complex assessments of patentability.[389] A psychology of intellectual property focuses on the creativity process and society's expectations of creativity rather than on society's ability to judge works objectively or only subjectively. The psychology of artistic creativity reveals that the key component of problem finding is subjective and emotional. The subjectivity, though, is that of the artistic creator, rather than that of the artistic audience, as emphasized in Clarisa Long's judgment theory.[390] Artistic creativity thus values the creator's finding of personal and emotional themes to express in his or her work, which is reflected in copyright's protectability standard. By contrast, the psychology of scientific creativity reveals that the essential value of problem solving includes an emphasis on objectivity, which is reflected in patent law's protectability standard. These distinctions also might explain why people do not want to judge someone else's personal, subjective art but are comfortable judging impersonal scientific creations, even though in theory they can do both.

Finally, the indexing theory—suggesting that the difference in protectability standards can be explained by the inability to index artistic works and the facility of indexing scientific and engineering inventions[391]—also works hand in hand with a psychology of intellectual property. Artistic works are hard to index for two reasons. First, the psychology of artistic creativity leads to the creation of a vast number of copyrightable works, as just described, leading to a difficulty in indexing. Additionally, because the

[389] *See supra* text accompanying notes 84–88.

[390] *See supra* text accompanying notes 84–88.

[391] *See supra* text accompanying notes 90–91.

problems found are typically personal and subjective, the solution of these problems—the artistic work—can be hard to characterize.[392] On the other hand, the fewer scientific and engineering inventions that are created make indexing easier. Moreover, because problem solution in science is more objectively grounded, patentable works are easier to index.

C. *Ill-Fitting Works*

The previous two sections explain how the protectability standards of patent law and copyright law accord with the scientific creativity and artistic creativity each respectively seeks to engender. These standards are also normatively desirable to the extent that the types of works protectable by each intellectual property regime match up with the psychological explanation of archetypical creativity for that regime. From a utilitarian perspective, the primary goal of patent and copyright law is to stimulate creativity in their respective spheres. Given the good match between patent law and prototypical creativity in scientific and technological invention and between copyright law and prototypical artistic creativity, then, the protectability standards of patent and copyright law are effective at stimulating creativity so long as the works protected by each of patent and copyright law fit the prototypical forms of creativity for each regime.

These respective explanations only succeed, however, for the prototypical creativity within the scientific and engineering domains and for the prototypical artistic creativity described by the psychological research. This section first discusses some atypical instances of patentability that do not match this prototypical account and, next, discusses some copyrightable works that do not fit easily in the psychological explanations for copyright law. The treatment of ill-fitting works in this section is illustrative rather than exhaustive, as its purpose is to demonstrate how this Article's theory of a psychology of intellectual property might be applied.

Before analyzing these ill-fitting works, it is worth constructing a general framework for what might be done with such works. There are four possibilities. First, one might declare an ill-fitting work in one intellectual property regime to be unprotectable under that regime due to the poor fit.[393] If it fits better within another intellectual property regime, it could seek refuge there. This approach ensures that each intellectual property regime remains internally consistent. Second, one might adjust the standards of the intellectual property regime to allow protection of ill-fitting works. Such an approach is premised on the idea that if society values the creativity associated with an ill-fitting class of works, it ought to find a way to offer an in-

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[392] *Cf.* Fromer, *supra* note 2, at 789–90 (wondering whether artists and society would feel comfortable with artists' demarcation of their works).

[393] Some works sometimes ought to be left out of copyright or patent for other reasons like stimulating further innovation, as with abstract ideas in patent and unfixed performances in copyright. In effect, society has decided that it wants to reward legal protection to certain, but not all, forms of creativity.

centive to create those works without creating new forms of intellectual property protection. Third, and relatedly, one might create sui generis protection to maintain theoretical consistency as in the first approach, but also provide an incentive for the ill-fitting form of creativity as in the second approach. Fourth, one might reject any form of intellectual property protection for the ill-fitting work altogether, to the extent that it is not sufficiently valuable to society to bear the cost of intellectual property protection in exchange for the incentivization of its creation.

1. Patent Law.—The emphasis in scientific and engineering creativity on problem solving and a large degree of newness helps explain the protectability standard for the prototypical patentable work.[394] Scientific creativity, however, also has forms that do not fit the mold suggested by this psychological prototype. A large portion of scientific creativity is not occupied with creating inventions but rather with crafting and verifying scientific theories. Going back almost as far as American patent law, a fundamental principle has been that scientific theories are not patentable[395] (but applications of these theories and ideas are).[396] One basis asserted by the U.S. Supreme Court for scientific theories' unpatentability is that they are "the basic tools of scientific and technological work" and ought to be available freely to advance innovation.[397] As another basis of unpatentability, the Supreme Court has also explained that scientific theories have "no substantial practical application."[398]

Although scholars puzzle over these justifications and how to draw lines between the patentable and unpatentable,[399] both of the Supreme Court's rationales can be explained in terms of a psychological understanding of scientific creativity and its application to patent law. As discussed above, much about theoretical science resembles the arts, in that it tends to emphasize problem finding, unlike scientific and engineering inventions.[400] The Supreme Court's concern that scientific theories lack considerable practical application aligns with the psychological understanding of scientific creativity. Creativity in scientific and engineering inventions focuses on problem solving, and these inventions are thus well suited to patent law's structure promoting problem solutions. Creativity in scientific theories, however, tends to concentrate more heavily on problem finding and is thus ill suited to patent law's focus on problem solving. It is perhaps not surprising, then, that scientific theorizing has much in common with artistic endeavors, another area where problem finding is key. For one thing, theo-

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[394] *See supra* Part III.A.

[395] *E.g.*, Le Roy v. Tatham, 55 U.S. (14 How.) 156, 175 (1852).

[396] Diamond v. Diehr, 450 U.S. 175, 187–88 (1981).

[397] Gottschalk v. Benson, 409 U.S. 63, 67 (1972).

[398] *Id.* at 71–72.

[399] *E.g.*, Kevin Emerson Collins, *Propertizing Thought*, 60 SMU L. REV. 317, 347–50 (2007).

[400] *See supra* text accompanying notes 191–92, 205–06.

rists of science believe that choosing to adopt one scientific theory is substantially influenced by the greater aesthetic beauty of the winning theory over the losing one.[401]

Given that scientific theories do not conform to patent law's focus on problem solving, patent law reasonably chooses to exclude these misfits from its shelter. Among the other problems with including them—including the critical concern that they would turn patent law on its head by, as Justice Breyer put it, "imped[ing] rather than 'promot[ing] the Progress of Science and useful Arts,' the constitutional objective of patent and copyright protection"[402]—patent law is not structured to assess the contribution of scientific theories because the law's structure sparks a different type of creativity.[403] Recognition of the focus in scientific theories on problem finding also casts new light on the Supreme Court's appraisal that theories are the building blocks to patent law's valued problem solutions in scientific and engineering inventions, and the Court appears unwilling to privatize these building blocks.

One might similarly view the patentability of the test-plus-correlate processes that the U.S. Supreme Court reviewed but never ruled on in *Laboratory Corp. of America Holdings v. Metabolite Laboratories, Inc.*[404] In that case, the Supreme Court was considering whether someone could patent a process for "using any test (whether patented or unpatented) to measure the level in a body fluid of an amino acid called homocysteine and then noticing whether its level is elevated above the norm" to show a possible vitamin deficiency.[405] Only slightly more concrete than an abstract scientific theory, the process "aside from the unpatented test, . . . embod[ies] only the correlation between homocysteine and vitamin deficiency that researchers uncovered[,]" which Justice Breyer described in his dissent as "an unpatentable natural phenomenon."[406] The creativity at issue in a test-and-correlate process relies solely on the scientific theory of the correlation between homocysteine and vitamin deficiency, the value of which comes disproportionately from the problem finding, or hypothesizing, of the correlation in the first instance.[407] Just as scientific theories, with their focus

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[401] *E.g.*, JAMES W. MCALLISTER, BEAUTY & REVOLUTION IN SCIENCE (1996).

[402] Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 548 U.S. 124, 126–27 (2006) (Breyer, J., dissenting) (quoting U.S. CONST. art. I, § 8, cl. 8).

[403] *Cf.* Oskar Liivak, *Maintaining Competition in Copying: Narrowing the Scope of Gene Patents*, 41 U.C. DAVIS L. REV. 177, 179–87 (2007) (arguing that gene discoveries, because they are copied from nature, should be patentable, but that their claim scope should be restricted in ways analogous to copyright law).

[404] 548 U.S. 124 (2006) (per curiam) (dismissing the writ of certiorari as improvidently granted).

[405] *Id.* at 125 (Breyer, J., dissenting).

[406] *Id.* at 137–38 (internal quotation marks omitted).

[407] This is distinct from the development of a drug that interacts with the body in a way dictated by the laws of chemistry and is theoretically patentable. The creativity of the drug development is surely

on problem finding, do not fit in well with patent law's emphasis on problem solving, the test-and-correlate processes do not naturally fit either.[408]

As another illustration, recent attempts to patent storylines[409] ought to fail in light of a psychology of intellectual property. Storylines are quintessential artistic creativity, in that they are preoccupied with problem finding and with some, but not too much, newness. As such, they do not fit nearly as well with patent law as they do with copyright law, where they already have a home.[410]

The controversy over whether business methods are patentable subject matter can also be analyzed in this framework. They fit easily enough into the categories of creative works where the emphasis is on the problem solution, like prototypical patentable technologies. Amazon.com's patented method for one-click shopping,[411] for example, is very much about solving the problem of quick and easy user shopping online. Where business methods might run into trouble as a class is that the solutions they offer are frequently not sufficiently novel.[412] Business operations have been in place for so long and are typically so relatively stable that it is harder to make significant leaps forward with them. For example, there is a strong chance that business methods not previously implemented in cyberspace have already been implemented in the physical world, sometimes making the solutions they offer redundant. Even for those business methods that are new—whether or not employed in cyberspace—they might not be sufficiently innovative to deserve protection. One-click shopping is one example of a likely insufficient advance.[413]

2. Copyright Law.—Creativity in scientific and engineering inventions is not the only type of creativity that has nonprototypical forms. Ar-

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based in part on the scientific theory correlating the drug with the laws of chemistry but is also about formulating the actual drug, which involves significant creativity in problem solving.

[408] *Cf.* Collins, *supra* note 399, at 354–60 (arguing that such claims are not patentable subject matter because they seek to propertize thought). Although the Supreme Court did not rule on the patentability of test-and-correlate processes, its initial grant of certiorari and Justice Breyer's subsequent dissent from the dismissal of the writ of certiorari as improvidently granted shone a spotlight on the possible unpatentability of these processes. Other cases raising similar claims are making their way through the courts. *E.g.*, Classen Immunotherapies, Inc. v. Biogen IDEC, 304 F. App'x 866 (Fed. Cir. 2008) (declaring that methods of evaluating and improving the safety of immunization schedules are unpatentable).

[409] *See generally* Andrew F. Knight, *A Potentially New IP: Storyline Patents*, 86 J. PAT. & TRADEMARK OFF. SOC'Y 859, 866–77 (2004) (arguing in favor of the patentability of storylines).

[410] *Cf.* Anu R. Sawkar, Note, *Are Storylines Patentable? Testing the Boundaries of Patentable Subject Matter*, 76 FORDHAM L. REV. 3001, 3004, 3050–53 (2008) (arguing that storylines should not be patentable because of the policies and doctrines underlying patent law).

[411] U.S. Patent No. 5,960,411 (filed Sept. 12, 1997).

[412] Andrew Kopelman, Note, *Addressing Questionable Business Method Patents Prior to Issuance: A Two-Part Proposal*, 27 CARDOZO L. REV. 2391, 2393–94 (2006).

[413] Jeanne C. Fromer, *The Layers of Obviousness in Patent Law*, 22 HARV. J.L. & TECH. 75, 86–87 (2008).

tistic creativity also has forms that do not fit the mold suggested by the prototypical form, which emphasizes problem finding and some, but not too much, newness.[414] Unlike prototypical artistic expression, these classes either value problem solving more than problem finding or are occupied with a large degree of newness. As such, copyright's standard of originality as currently interpreted might not be appropriate for them.[415] After demonstrating some examples of nonprototypical works, I suggest how intellectual property laws might handle them.

Some works currently considered copyrightable are in principle significantly less about problem finding than problem solving. One pertinent example is computer source code.[416] Computer source code is nearly always written to be translated into machine-readable code, which a computer can directly execute as a computer program.[417] The code's typical purpose then is a functional one: to solve a problem.[418] The principal rationale for programmers to write the source code that produces, say, Microsoft's Internet Explorer, is not to express personal and emotional themes in a particular medium but to construct a functional web browser.[419] Much source code is, in fact, proprietary and is read just by its programmers trying to solve a problem and machines translating the code into executable code.[420] Given that writing computer source code is more about problem solving than problem finding, it is an uneasy fit in copyright law, in which the protectability standard is tailor-made for expression valued for its problem finding.

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[414] *Supra* Part II.B.3.

[415] *Cf.* Pamela Samuelson, *The Originality Standard for Literary Works Under U.S. Copyright Law*, 42 AM. J. COMP. L. SUPP. 393, 417 (1994) ("The originality standard for literary works will thus become the originality standard for virtually all classes of works in the digital realm.").

[416] 17 U.S.C. § 101 (2006) (defining "literary works" as "works, other than audiovisual works, expressed in words, numbers, or other verbal or numerical symbols or indicia, regardless of the nature of the material objects"); § 102(a)(1) (stating that copyright protection extends to "literary works"); § 117 (establishing limited exceptions to the general prohibition on copying computer programs).

[417] *See* RAVI SETHI, PROGRAMMING LANGUAGES: CONCEPTS AND CONSTRUCTS 8 (2d ed. 1996).

[418] Recent Case, Junger v. Daley*, 209 F.3d 481 (6th Cir. 2000)*, 114 HARV. L. REV. 1813, 1818 n.39 (2001); Karjala, *supra* note 10, at 442–44.

[419] That is not to say that many software programmers do not enjoy writing elegant code. *E.g.*, ERIC STEVEN RAYMOND, THE ART OF UNIX PROGRAMMING ch. 6 (2003), http://snap.nlc.dcccd.edu/reference/taoup/transparencychapter.html (last visited May 30, 2010). Code that is elegant—by being powerful and simple—is, however, ultimately written in the service of creating better performing software. *Id.* ("Elegant code is not only correct but visibly, *transparently* correct. It does not merely communicate an algorithm to a computer, but also conveys insight and assurance to the mind of a human that reads it. By seeking elegance in our code, we build better code."). Concern with elegant code is thus effectively about problem solving.

[420] Recent Case, *supra* note 418, at 1816–17 (noting that there are, however, certain times when it is more expressive, communicating to "a human programmer to understand how to produce th[e] outcome" intended by the source code). *But cf.* ERIC S. RAYMOND, THE CATHEDRAL AND THE BAZAAR 79–112 (1999) (describing the open-source movement, which shares software code publicly so that third parties can add on or change the code to create new types of software functionality).

Computer source code is not the only example of expression protectable by copyright that is more concerned with problem solving than finding. Dennis Karjala catalogues a number of other types of categories of expression valued principally for their functions, including accounting systems, created "facts" and valuations, taxonomies, model codes and statutes, and standardized tests for psychological or intellectual attributes.[421] Jane Ginsburg relatedly argues in favor of protection for certain works that are often considered to have "low authorship," principally facts and information collected in databases.[422] At the base of her argument seems to sit the notion that compiled data can be conceptualized as answers to carefully constructed questions, rather than personally or emotionally grounded findings of problems.[423] Karjala argues that, because these works are principally functional, they ought to be channeled into patent law, which protects functional items should they be sufficiently novel, nonobvious, and useful.[424] Although Karjala does not ground his conclusion in the psychology of creativity, the psychological analysis provides a framework for Karjala's conclusions. Expression valued more for its solution of problems than its finding of them might be redirected out of copyright law to patent law, which is constructed to protect creativity that is about solving problems.

There is a worry, though, that patent law's concern with a large degree of newness might be set too high for the creativity involved in expression concerned with problem solving. If true, current patent law might not be the most effective means to encourage creativity in expressive problem solving, because it might require too much newness. In that case and if these types of expression are worth encouraging and can be distinguished easily from the prototypical forms of scientific creativity, the law might instead provide a form of intellectual property protection—whether through copyright, patent, or in a sui generis form—whose safeguard would depend on the quality of the problem solved, as patent law does, but without requiring as much newness as patent law usually does. Such a solution would accord with Ginsburg's detailed findings that copyright law traditionally

[421] Karjala, *supra* note 10, at 468–517.

[422] Ginsburg, *supra* note 72, at 1907–13.

[423] *See id.* at 1868–71.

[424] Karjala, *supra* note 10, at 447–48, 452. *But see* Lunney, *supra* note 99, at 2431 (arguing that certain useful works, like software, ought to be protectable by copyright). Although the Supreme Court's recent foray into patentable subject matter did not resolve conclusively whether software is patentable, *see* Bilski v. Kappos, 130 S. Ct. 3218, 3227 (2010) (implying for four Justices that a restrictive test for patentability might improperly exclude software); *id.* at 3231 (Stevens, J., concurring in the judgment) (writing for another four Justices without speaking definitively on software's patentability), recent commentators tend to think that software, if claimed properly, is patentable, *e.g.*, Renee McGaw, *Supreme Court Rules in* Bilski *Patent Case*, DENVER BUS. J., June 28, 2010, http://www.bizjournals.com/denver/stories/2010/06/28/daily8.html; Michael Risch, *Forward to the Past*, 2009–2010 CATO SUP. CT. REV. 333, 367.

protected many low authorship works—such as databases created through the sweat of the brow—and that the law ought to encourage their creation.[425]

Another subset of copyrightable subject matter falling outside the prototypical form of artistic creativity is work in those domains in which vast degrees of newness are expected and acclaimed. One of the most prominent areas in which this occurs is jazz music, as described above.[426] The conventions for jazz music accentuate that its conventions are to be broken, leading to larger and larger degrees of newness, often through improvisation.[427] Other forms of experimental arts similarly highlight breaking rules and being very new, such as the avant-garde art movement.[428]

Moreover, as discussed previously,[429] the account of copyright encouraging works with some but not too much newness assumes that the consuming audience does not have the unusual preference for more newness, something typically true of general audiences but less so of artists and critics. When this assumption holds for the principal audience, copyright law probably ought to encourage minimal newness, as creativity is in large part about appropriateness in culture and intellectual property laws are about encouraging creativity. When it does not—as with, say, avant-garde forms of art and music whose principal consumers are frequently other artists or critics[430]—these copyrightable works do not fit naturally into the account in the previous section.

Under these circumstances, larger degrees of newness are demanded either by the artistic form's conventions or by the principal audience than in the prototypical situation. Therefore, copyright's low bar of newness might not be sufficient to encourage the production of highly new works in these areas, but will only encourage moderately new ones. One solution would be to raise the degree of newness expected of these types of copyrightable works in order to increase the incentive to create new art forms in newness-loving domains or for newness-loving audiences.[431]

In sum, to the extent that society cares about giving incentives to produce nonprototypical forms of artistic or scientific creativity, intellectual property laws ought to be adjusted to calibrate their protectability standards with the qualities of these nonprototypical forms of creativity. These illustrations of works that do not fit the prototypical forms of creativity in the arts or scientific and engineering inventions suggest that a complete psy-

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[425] Ginsburg, *supra* note 72, at 1870–71.

[426] *See supra* text accompanying notes 288–89.

[427] *See supra* text accompanying notes 288–89.

[428] *See generally* ART OF THE AVANT-GARDES (Steve Edwards & Paul Wood eds., 2004) (discussing the avant-garde movement).

[429] *Supra* text accompanying note 290.

[430] ART OF THE AVANT-GARDES, *supra* note 428.

[431] Gideon Parchomovsky and Alex Stein have suggested a number of ways to heighten newness requirements in copyright law. *See supra* note 379.

chology of intellectual property must decide how, if at all, to allow protection for these ill-fitting works.

CONCLUSION

This Article asks why the protectability standards for patent and copyright law look so different if both laws have the same constitutionally grounded purpose of "promot[ing] 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."[432] Any unified theory of intellectual property must be able to explain and justify why these standards are distinct, with patent requiring the stringent standards of novelty, nonobviousness, and utility and with copyright requiring only originality—independent creation and a modicum of creativity.

In this pursuit, it is helpful to turn to the psychology of creativity. Given that the main accepted goal of patent and copyright law is to stimulate creativity in scientific and engineering endeavors as well as the arts, an investigation into how scientific and artistic creativity each proceeds might explain the differences in protectability. This psychology of creativity demonstrates that patent law shields, thereby motivating scientific creativity, and that copyright law protects, thereby stimulating artistic creativity. Scientific creativity, particularly in producing inventions, is typified by both an emphasis on problem solving and a large degree of newness. By contrast, artistic creativity is characterized by both an emphasis on problem finding and some, but not too much, newness. This Article offers a new psychological account of intellectual property, which has a great deal of explanatory power. The pertinent differences between creativity in the scientific and artistic domains accord with patent law's requirements of novelty, nonobviousness, and utility as a prerequisite to protection and copyright law's originality requirement.

A psychological theory of intellectual property also is a good normative fit for structuring patent and copyright law because the goal of intellectual property law is to stimulate creativity. A psychological approach suggests that patent is a poor fit for works that do not share the characteristics of prototypical creativity for scientific and engineering inventions, just as copyright is an uneasy home for works that do not share the characteristics of prototypical artistic creativity. This Article illustrates how intellectual property law might handle these poor fits.

This Article takes two important steps. First, it suggests that a unified theory of intellectual property might exist, despite the manifest differences between patent and copyright law. The possibility of using the same theoretical approach to explain or challenge their dissimilarities indicates that, at their subterranean foundation, patent and copyright law have more in com-

[432] U.S. CONST. art. I, § 8, cl. 8.

mon than is commonly appreciated. Second, this Article suggests that applying the psychology of creativity to understand intellectual property laws is germane given the purposes of intellectual property laws. This approach is specifically helpful in analyzing the difference between the protectability standards in patent and copyright law.

Although this Article's analysis is limited to the protectability standards of intellectual property, the psychological research and framework that informs the analysis might readily be applied to other areas of intellectual property. This research and framework might also help shed light on the breadth and duration of copyright and patent law, as well as the competing rights between initial creators and derivative or follow-on creators. These insights also might be applied to related forms of intellectual property, such as design patents where the arts overlap with the sciences and engineering.

In sum, like the process of creativity generally, this Article engages in problem finding and problem solving. The problem finding is wondering why there is a difference in the protectability standards of patent and copyright law, an undertheorized but important question in comprehending and structuring intellectual property laws. The problem solving is making evident a link between the psychology of creativity and patent and copyright laws and analyzing how the protectability standards of the patent and copyright regimes are in accord with and justified by the type of creativity each is seeking to promote.