Left-Brain versus Right-Brain: Competing Conceptions of Creativity in Intellectual Property Law

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An ongoing debate at the heart of intellectual property law pits those who argue for efficiency objectives against those who seek to advance other social goals. Proponents of the former model focus on the need for intellectual property regimes to provide incentives to creators, while proponents of the latter aspire to protect creators' natural rights or secure an environment for greater human flourishing. Both observers and participants in these disputes typically lose sight of a common ambition underlying these competing conceptions of intellectual property law — the desire to promote creativity. Promoting creativity can serve both the incentive goals of intellectual property and advance more holistic personal, cultural, and social interests.

Psychological, neurobiological, and cultural research now provides a wealth of information on how to promote creativity. Unfortunately, intellectual property law has failed to recognize these insights and instead remains moored in doctrine derived from archaic stereotypes about creativity and the creative process. These distorting stereotypes appear, for example, in the laws concerning joint authors and joint inventors. Based on historical and comparative law evidence, this Article argues that

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joint creator law has evolved, at least in part, not from its traditionally identified sources, but from commonly held stereotypes about left-brain scientists versus right-brain artists engaging in fundamentally distinct creative processes. Modern research shows that these creativity stereotypes are false. As a result, joint creator law specifically, and intellectual property law more generally, likely do not promote progress to the fullest extent feasible. Stereotype-driven doctrine appears to hinder creativity and valuable collaboration in both artistic and technological endeavors. Leveraging these interdisciplinary teachings yields valuable insight for how to revise patent and copyright law to promote creativity more effectively.

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INTRODUCTION

That legal decisions should not be based upon misguided stereotype is one of the most universally agreed social principles. Yet stereotype-driven analysis continues to prevail in intellectual property law. While not as pernicious as racial or gender prejudices, stereotypes in intellectual property law still may result in substantial harm. These biases distort legal decisions and thwart the fundamental goal of intellectual property to promote progress in technology and the arts.

Though not commonly recognized as prejudices, intellectual property stereotypes involve sociocultural biases concerning artists and inventors. Popular conceptions of artistic creativity versus inventive creativity differ significantly. Artistic creativity is commonly perceived as a more intuitive, holistic, and personal process. It is conventionally associated with right-brain mode of thinking. Inventive creativity, on the other hand, is commonly viewed as a more linear and analytical process that is externally-mandated by technical requirements. It conventionally entails left-brain cognition.

Psychological, neurobiological, and cultural research, however, now reveals that these traditional dichotomous views of creativity are erroneous. The inventive process is not only analytical, but is also routinely intuitive and dynamic. Inventors often do not know what they are going to achieve or how they are going to achieve it, and commonly produce inventions that differ from their original goals. Inventions from Post-it notes to the microwave oven were achieved only because inventors thought in holistic, unregimented manners. Conversely, artistic creation is not only intuitive, but also regularly involves logical cognitive processing and externally-focused objectives. The importance of such analytic creativity is unambiguous in many historic works of art, such as Michelangelo's *David*, Leonardo da Vinci's *Mona Lisa*, and William Shakespeare's plays. It is also evident in modern works of art, such as Pablo Picasso's paintings, J.K.

Rowling's Harry Potter books, and Annie Leibovitz's photographs, all of which display numerous careful, analytic components. Recent research shows that the common stereotypes segregating artistic versus scientific creativity, as well as the entire left-brain/right-brain paradigm, are vast oversimplifications. Rather, truly inspired creativity, whether artistic or inventive, springs not from half a brain, but from a harmonious integration of both analytical and intuitive styles of ingenuity.

Intellectual property law fails to appreciate these contemporary insights. Despite patent and copyright laws' matched objectives of promoting creativity, the doctrines display remarkable variation in their respective forms and functions. The cause of many of the doctrinal differences between copyright and patent is often explained functionally, based upon the differing histories, different subject matters, and differing standards and rights. These commonly held assumptions about the genesis of intellectual property law, however, can be examined by comparing analogous areas of patent and copyright law, and can be refuted in certain instances. This analysis reveals that the conventional explanatory model of intellectual property — that is, how and why intellectual property developed in the manner it has — is incorrect.

Debunking the conventional wisdom raises an intriguing question: if the functional explanation for intellectual property law does not account for current doctrine, then where does it come from? The analysis here supports a novel behavioral theory of intellectual property law: that significant components of the divergence between patent and copyright doctrine result from socially romanticized, simplified, and largely inaccurate stereotypes about differences between the creative processes of artists versus inventors. Whether lawmakers articulate it or not, they (like most of society) view artistic and inventive creativity as arising from fundamentally different cognitive processes, and this perception has influenced the law.

To investigate the creativity stereotype hypothesis, this Article concentrates on one doctrinal area — the law of joint creators. Joint creator law pertains to whether an individual (such as a collaborator, assistant, or supervisor) has contributed enough to an endeavor to be entitled to the status of joint inventor or joint author, and consequently entitled to concomitant patent or copyright rights in the underlying intellectual property. Joint owners of intellectual property are typically treated as tenants in common and possess equal rights to produce, distribute, and license the intellectual property. Joint creator law provides an informative example for analyzing creativity stereotypes because the function of the doctrine in copyright and

patent law is similar and because the doctrines developed after similarities between the objectives of patent and copyright law were well recognized. Though this Article focuses on joint creator law for concision, many other areas of patent and copyright doctrine that perform similar functions, but display substantial doctrinal discrepancies (such as the thresholds for protection and the attribution, scope, and duration of rights), could be mined for a similar analysis as well, some of which is discussed here.

Part I of the Article introduces the conventional explanatory wisdom for the differences between joint author and joint inventor law, which turns out to be the same as that used across many areas of patent and copyright: that the fields' different underlying subject matters, creativity thresholds, or intellectual property rights necessitate the discrepancies. Analysis of the evolution of joint creator doctrine, the text of the opinions in which the doctrine developed, and a comparative study of foreign copyright and patent law, however, all reveal that these explanations do not withstand scrutiny.

Given that the extant explanation is insufficient, Part II turns to identifying a more accurate explanatory model for intellectual property. Arguing inductively, this section proposes that the differences between joint inventor and joint author law are best explained by commonly held stereotypical biases concerning differing social attitudes towards the creativity and the creative processes believed to produce technological innovation versus artistic expression. This analysis is based on the correspondence between creativity stereotypes and legal doctrine, the text of legal opinions concerning joint creator law, a comparative law and comparative cultural analysis, and even on the differences in timing in the historic development of joint inventor versus joint author law.

Because joint creator law appears to have developed based on stereotypes of creativity, it may not optimally promote the ultimate goals of the patent and copyright systems. Part III of the Article explains that both joint inventor and joint author law appear to actually dissuade certain potential co-inventors and co-authors from collaborative endeavors, and that such dissuasion cannot be defended on either efficiency or equitable grounds. This deterrence is highly problematic today, as an overriding proportion of technological innovation relies on collaborative research, and collaborative efforts are increasingly valuable for modern artistic expression as well.

Despite its central objective of promoting creativity, intellectual property law remains moored in archaic stereotypes of authors and inventors, and has changed little in response to modern research on how best to promote creativity. This Article concludes with proposals

for improving the function of joint creator law based on interdisciplinary creativity research. The proposals include reducing the disparities between joint author and joint inventor doctrine, equitably apportioning joint creator rights, and establishing a new substantive standard for determining joint creatorship status in both patent and copyright law.

I. THE CONVENTIONAL EXPLANATORY MODEL OF INTELLECTUAL PROPERTY

For two doctrines that share such similar objectives, it is striking how little patent law and copyright law cohere. The Constitution grants Congress patent and copyright authority in a single Intellectual Property Clause, and each body of law is directed to the same constitutional purpose, promoting progress.[1] Congress passed the first patent act early in its first term and the first copyright act the following month.[2]

It is true that copyright and patent had quite different histories prior to the Constitution and first American statutes. The conventional explanatory model of how intellectual property developed, in fact, relies on these histories as significantly determinative. This standard rationale considers that the numerous discrepancies across many areas of patent and copyright law are necessitated by the fields' differing underlying subject matter (technological innovation versus artistic expression), differing creativity thresholds (nonobviousness versus originality), and different substantive intellectual property rights.[3] A more rigorous analysis, however, reveals that these common explanations are both underdetermined and historically inaccurate.

Comparing similar doctrinal areas across different fields of intellectual property helps reveal the problems with the conventional scholarly model of how intellectual property law developed. Analyzing joint author versus joint inventor law provides an informative cross-

[1] U.S. CONST. art. I, § 8, cl. 8 ("[The Congress shall have Power] To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.").

[2] An Act to promote the progress of useful Arts, ch. 7, 1 Stat. 109 (Apr. 10, 1790); An Act for the encouragement of learning, by securing the copies of maps, charts, and books, to the authors and proprietors of such copies, during the times therein mentioned, ch. 15, 1 Stat. 124 (May 31, 1790).

[3] *See*, *e.g.*, John Duffy, *Inventing Invention: A Case Study of Legal Innovation*, 86 TEX. L. REV. 1, 8-10 (2007) (discussing these reasons as generally perceived bases for differences between copyright and patent doctrine); John Wiley, Jr., *Copyright at the School of Patent*, 58 U. CHI. L. REV. 119 (1991) (discussing these and other reasons as bases for differences between patent and copyright doctrine).

comparison here because the function of the doctrine in patent and copyright is similar, and because the doctrines developed after similarities among the objectives of the patent and copyright systems were well recognized. Absent the bias of hindsight, one would likely expect that identically directed legal doctrines would share some substantive similarity.[4] As with much of the patent and copyright systems, this is not the case for joint creator laws.

Legal scholars have previously noted, but rarely analyzed, the differences between joint inventor and joint author law.[5] When analyzed, the differences are commonly explained as arising out of differing subject matter, creativity thresholds, or other intellectual property rights.[6] This is where the value of cross-comparison across patent and copyright fields becomes evident.[7] Though picking and choosing certain aspects of the traditional explanations could allow one to account for either joint inventor or joint author law independently, none of the common explanations satisfyingly explains both doctrines or their variance.

The laws of joint inventorship and joint authorship each developed in common law and were later codified. Somewhat strikingly, the common law development of the doctrines was separated by a century in the United States.[8] Neither development equates with the common explanatory model of intellectual property law. In fact, early judicial opinions developing joint inventor and joint author law display remarkably little attention to the underlying objectives of the patent or copyright systems at all. Rather, the decisions primarily involve relatively superficial equitable analyses focused essentially on the isolated works at issue in each case.

Reliance on equity in deciding joint creator cases is not, of course, problematic in itself. This reliance, however, is pertinent to this Article's thesis for two reasons. First, it indicates that lawmakers were

[4] *E.g.*, Wiley, *supra* note 3, at 119, 181.

[5] *Id.* (noting dearth of analysis).

[6] *See, e.g.*, WILLIAM LANDES & RICHARD POSNER, THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW 318 (2003) (discussing differences in joint creator law and rights); 3 R. CARL MOY, MOY'S WALKER ON PATENTS § 10:50 (4th ed. 2008) (discussing differences in accounting standards); Philippe Ducor, *Intellectual Property: Coauthorship and Coinvertorship*, 289 SCI. 873 (2000) (hypothesizing about why more authors are named in science articles than in corresponding patents).

[7] *See* Jeanne Fromer, *A Psychology of Intellectual Property*, 104 NW. U. L. REV. (forthcoming 2010) (manuscript at 2), *available at* http://ssrn.com/abstract=1575843 (noting that comparing copyright and patent law can provide better understanding of role of laws).

[8] *See infra* Parts I.A-B.

not relying on any of the conventionally attributed bases for the differences between joint inventor and joint author law. Second, it provides a basis for challenging common intuitions about equity, as allegedly "equitable" decisions in joint author versus joint inventor cases produce diametrically different results. These results lay the groundwork for debunking certain myths about the evolution of intellectual property law, and open the search for an alternative causal explanation.

A. The Evolution of Joint Inventor Law

Joint inventor law arose in the United States at the beginning of the nineteenth century. In one of the earliest reported joint inventor cases, Justice Story, a critical figure in the development of several areas of patent law, held that two parties could be joint inventors where "both were concerned in the invention" and the invention was the result of the "simultaneous production of the genius and labor of both parties."[9]

The central issue in most nineteenth century joint inventor cases concerned delineating the measure of contribution necessary to qualify for joint inventorship. Courts were clear that simply providing information already available in the public domain was insufficient to obtain joint inventorship. For example, Samuel Morse consulted with a number of other scientists worldwide before inventing the telegraph in the 1830s.[10] When competing telegraph manufacturers challenged Morse's rights to certain telegraph patents on these grounds, the Supreme Court held that providing general information and advice to Morse did not turn his contacts into joint inventors:

> [I]t can make no difference . . . whether [Morse] derives his information from books, or from conversation with men skilled in the science . . . . And the fact that Morse sought and obtained the necessary information and counsel from the best sources, and acted upon it, neither impairs his rights as an inventor, nor detracts from his merits.[11]

[9] Stearns v. Barrett, 22 F. Cas. 1175, 1181 (C.C.D. Mass. 1816) (No. 13,337). There is at least one reported joint inventor case in the United States that precedes *Stearns*, but the jury instruction (which is the content of the report) does not describe substantive joint inventorship law. Reutgen v. Kanowrs, 20 F. Cas. 555, 556-57 (D. Pa. 1804) (No. 11,710).

[10] O'Reilly v. Morse, 56 U.S. 62, 69-72 (1853).

[11] *Id.* at 111.

A second Supreme Court case from the mid-1800s, *Agawam Woolen Company v. Jordan*, concerned an employee of the patent owner who claimed that he and other employees had contributed to the patented apparatus for spinning yarn and, thus, should be entitled to joint inventorship.[12] The Supreme Court held that although the employees had made a novel contribution to the invention, their contribution merely "proved to be a useful auxiliary part of the invention," and was such only after the patent owner had added another critical element.[13] On this basis, the Court concluded that "it is nevertheless a great error to regard [the employees' contribution] as the invention described in the subsequent patent, or as such material part of the same."[14]

Providing information already available in the public domain or making an auxiliary contribution to an invention thus was not sufficient for joint inventor status. Identifying the threshold of contribution necessary to merit joint inventorship, however, proved more difficult to define. As one court would later note, "The exact parameters of what constitutes joint inventorship . . . is one of the muddiest concepts in the muddy metaphysics of the patent law."[15] The positive contours of joint inventorship remained relatively unelaborated into the twentieth century.

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[12] Agawam Wollen Co. v. Jordan, 74 U.S. 583, 604 (1868). At this time, neither employers nor employees were favored concerning patent rights to inventions produced during employment; rather patent rights were based on who achieved the invention. Catherine Fisk, *Removing the 'Fuel of Interest' from the 'Fire of Genius': Law and the Employee-Inventor, 1830-1930*, 65 U. CHI. L. REV. 1127, 1132-33 (1998) [hereinafter *Law and the Employee Inventor*].

[13] *Agawam*, 74 U.S. at 606.

[14] *Id.*

[15] Mueller Brass Co. v. Reading Indus., 352 F. Supp. 1357, 1372 (E.D. Pa. 1972), *aff'd*, 487 F.2d 1395 (3d Cir. 1973). The definitional difficulties during the Nineteenth century are exacerbated by a lack of clarity in certain cases concerning whether the contributor was trying to establish sole inventorship or joint inventor rights. In *Agawam*, for example, the Supreme Court held that the collaborator's contribution "must have embraced the plan of the improvement, and must have furnished such information to the person to whom the communication was made that it would have enabled an ordinary mechanic, without the exercise of any ingenuity and special skill on his part, to construct and put the improvement in successful operation." *Agawam*, 74 U.S. at 602-03. The opinion is somewhat unclear about whether this requirement applies to joint inventorship or sole inventorship. Similarly, in another case from the nineteenth century, the court held that it was not necessary for a collaborator to "communicate every minute thing about the invention," though the collaborator must "communicate[] the substance," in order to defeat the patentee's sole inventorship rights. Alden v. Dewey, 1 F. Cas. 329, 330 (C.C.D. Mass. 1840) (No. 153,330). Though not entirely clear, it appears from the opinion that this requirement is directed towards a collaborator establishing joint inventor status rather than sole inventor rights.

Congress enacted Patent Act amendments in 1952 that began to clarify joint inventor law by establishing explicit authority for co-inventors to apply for a patent jointly.[16] Though codified for the first time, the right to apply for a patent jointly was considered to have been implicit in the original Patent Act of 1790, in part because of its use of the phrase "person or persons" to describe inventors.[17] Though the 1952 amendments formally provided for the possibility of joint inventors, they did not define or provide standards for achieving joint inventor status.[18]

Following the 1952 amendments, courts continued to define joint inventorship primarily in the negative, routinely stating what joint inventorship was not, but failing to articulate what did make a contributor a joint inventor. Various decisions stated that offering "mere suggestions," making improvements in another's experiments (unless very significant), and conceiving of "the result to be obtained" rather than how to obtain it, each lacked the quantum of contribution necessary to merit joint inventorship.[19] Then, in a 1967 case concerning a patent on the lining of plastic pharmaceutical bottles, district court Judge Holtzoff provided a discussion of joint inventorship that became widely influential:

> To constitute a joint invention, it is necessary that each of the inventors work on the same subject matter and make some contribution to the inventive thought and to the final result. . . . It is not necessary that the entire inventive concept should occur to each of the joint inventors, or that the two should physically work on the project together. . . . The fact that each of the inventors plays a different role and that the contribution of one may not be as great as that of another, does not detract from the fact that the invention is joint, if each makes some original contribution, though partial, to the final solution of the problem.[20]

Somewhat remarkably, Judge Holtzoff's analysis is developed in a lengthy paragraph devoid of direct citation, referring only at the end to a "pertinent discussion" of joint inventor law in a case from the early

[16] Act of July 19, 1952, ch. 950, 66 Stat. 799 (codified at 35 U.S.C. § 116 (2006)).

[17] S. REP. NO. 82-1979, at 15 (1952), *reprinted in* 1952 U.S.C.C.A.N. 2394, 2412.

[18] 35 U.S.C. § 116 (2006).

[19] Garrett Corp. v. United States, 422 F.2d 874, 881 (Ct. Cl. 1970); Land v. Dreyer, 155 F.2d 383, 387 (C.C.P.A. 1946); *Mueller Brass*, 352 F. Supp. at 1373-74.

[20] Monsanto Co. v. Kamp, 269 F. Supp. 818, 824 (D.D.C. 1967).

1900s.[21] Neither Judge Holtzoff nor the earlier decisions relied on any considered analysis of the incentive or creativity goals of patent law. Rather, the decisions all appear to be based primarily on ad hoc reactions to the instant facts of the particular cases.

Just as positive law concerning the contribution necessary to merit joint inventorship was beginning to take form, new complications emerged, particularly due to a rise in the prevalence of team research during the 1960s and 1970s. Questions arose concerning whether a contributor had to make the necessary contribution to every claim of a patent in order to merit joint inventorship, or whether someone who contributed to only a subset of the claims was a joint inventor in the entire patent.[22] Some courts applied an "all-claims" rule, holding that a collaborator had to contribute to every claim in order to be entitled to joint inventorship.[23] The all-claims rule created significant complexity concerning how to file patent applications when multiple inventors developed a technology, but some did not contribute to every claim, a routine occurrence in team innovation. In light of these difficulties, other courts applied a "non-all-claims" rule, under which a collaborator could be listed as a joint inventor on a patent application so long as he or she made the necessary contribution to at least one claim.[24]

The growing importance and complexity of joint inventor issues led Congress to amend the joint inventor provisions of the Patent Act in 1984. The new, current language of § 116 states,

> Inventors may apply for a patent jointly even though (1) they did not physically work together or at the same time, (2) each did not make the same type or amount of contribution, or (3)

[21] *Id.*; William R. Thropp & Sons Co. v. De Laski & Thropp Circular Woven Tire Co., 226 F. 941, 949 (3d Cir. 1915); De Laski & Thropp Circular Woven Tire Co. v. William R. Thropp & Sons Co., 218 F. 458, 464 (D.N.J. 1914).

[22] A patent typically contains multiple claims to the subject invention, each covering broader or narrower aspects of the invention, and the validity of each claim is evaluated independently. 35 U.S.C. §§ 112, 282 (2006). The average patent contains about fifteen claims. John R. Allison & Mark A. Lemley, *Who's Patenting What? An Empirical Exploration of Patent Prosectuion*, 53 VAND. L. REV. 2099, 2121 (2000).

[23] *E.g.*, *In re* Sarett, 327 F.2d 1005, 1010 n.7 (C.C.P.A. 1964); Rival Mfg. Co. v. Dazey Prod. Co., 358 F. Supp. 91, 101 (W.D. Mont. 1973).

[24] *See* Ethicon, Inc. v. U.S. Surgical Corp., 135 F.3d 1456, 1469 (Fed. Cir. 1998) (Newman, J. dissenting) (discussing problems with all-claims rule prior to 1984 amendments); SmithKline Diagnostics, Inc. v. Helena Lab. Corp., 859 F.2d 878, 887-88 (Fed. Cir. 1988); SAB Industri AB v. Bendix Corp., 199 U.S.P.Q. (BNA) 95, 104 (E.D. Va. 1978).

> each did not make a contribution to the subject matter of every claim of the patent.[25]

The 1984 amendments were an explicit attempt to codify, in general, the existing common law of joint inventorship.[26] The first two elements of the § 116 amendments are drawn from Judge Holtzoff's 1967 decision. The final element derived from Congress's express intent to adopt the non-all-claims rule.[27]

Pertinent to the discussion here, Congress's desire to promote team research was the primary reason for selecting the non-all-claims rule.[28] This explicit functional objective stands in stark contrast to the routine reliance on individual fairness-based decisions in most of the opinions developing joint inventor law. Ironically, in *Ethicon Incorporated v. U.S. Surgical Corporation*, the leading case interpreting the non-all-claims rule, the Federal Circuit, the Court of Appeals that hears nearly all appellate patent cases, appeared to revert to an ad hoc equitable analysis.[29] In *Ethicon*, Inbae Yoon was a medical doctor and inventor of numerous patented devices. Young Jae Choi was an electronics technician, without a college degree, who worked as an unpaid assistant to Yoon on several surgical devices that Yoon was already developing.[30] The Federal Circuit held that Choi had contributed to the conception of two of the claims of Yoon's patent at issue, covering a tool for endoscopic surgery, and that this contribution entitled Choi to an equal, undivided interest in the entire patent.[31] Judge Newman argued in dissent that § 116's inclusion of anyone who contributed to a claim as a joint inventor did not necessitate that all joint inventors also have equal ownership in the patent.[32] Joint inventorship need not mandate equal ownership. The *Ethicon* majority, however, ignored the possibility of an unequal

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[25] 35 U.S.C. § 116 (2006).

[26] *Section-by-Section Analysis of H.R. 6286, Patent Law Amendments Act of 1984*, 130 CONG. REC. 10525-29 (1984), *reprinted in* 1984 U.S.C.C.A.N. 5827, 5833 [hereinafter *Section-by-Section Analysis*].

[27] *Id.* at 5834.

[28] *Id.* at 5833. In addition to section 116, other changes in the 1984 Patent Act Amendments were made to facilitate collaborative work. Section 103, requiring an invention be nonobvious in order to merit a patent, was amended so that a research team's prior work would not count as prior art against later work by the same team with different members, and section 120 was modified to permit a research team's later application to relate back to an earlier filing date in certain circumstances. *Id.*

[29] *Ethicon*, 135 F.3d at 1458.

[30] *Id.* at 1459.

[31] *Id.* at 1461-64.

[32] *Id.* at 1468-72 (Newman, J., dissenting).

division of patent rights based upon each joint inventor's contribution. The court awarded an undivided one-half interest to Choi, even though Choi contributed to the conception of only two of the dozens of patent claims, neither of which was even involved in the underlying infringement at issue in *Ethicon*.[33] The rationale provided in the majority opinion is based more on general equity considerations rather than a desire to promote any patent law objectives. This conclusion is underscored by the majority's criticism of Yoon's inconsistent testimony and attempts to alter evidence,[34] behavior that was clearly unethical, but not relevant to the joint inventor dispute.

Although the 1984 amendments help to clarify joint inventor law, they still define joint inventorship largely in the negative. Section 116 describes who is not a joint inventor, but does not explain who is. This may have been an intentional effort by Congress to avoid rigid rules that might disqualify appropriate individuals,[35] but this concern does not obviate the need for a doctrine that defines how or when someone achieves joint inventorship. Since the time of Aristotle it has been recognized that something cannot be defined only by describing what it is not.[36]

Federal Circuit case law now defines joint inventorship, providing that a collaborator is a joint inventor if he or she:

> (1) contributes[s] in some significant manner to the conception . . . of the invention, (2) make[s] a contribution to the claimed invention that is not insignificant in quality, when that contribution is measured against the dimension of the full invention, and (3) do[es] more than merely explain to the real inventors well-known concepts and/or the current state of the art.[37]

The latter two elements derive from the nineteenth century Supreme Court decisions in *Morse* and *Agawam Woolen* discussed above. The first element finally clarifies the substantive standard that a joint inventor must supply, requiring a contribution to the inventive aspect,

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[33] *Id.* at 1459, 1465-66 (majority opinion).

[34] *Id.* at 1462.

[35] *Section-by-Section Analysis*, *supra* note 26, at 5834.

[36] SIMON WINCHESTER, THE MEANING OF EVERYTHING: THE STORY OF THE OXFORD ENGLISH DICTIONARY 116-17 (2004).

[37] Pannu v. Iolab Corp., 155 F.3d 1344, 1351 (Fed. Cir. 1998); *see Ethicon*, 135 F.3d at 1460.

or "conception," of the invention.[38] Although a step in the right direction, this definition still leaves significant uncertainty.

The meaning of "conception" in patent law is different from the plain English meaning of the term. Conception of an invention for patent purposes requires the "formation in the mind of the inventor, of a definite and permanent idea of the complete and operative invention, as it is hereafter to be applied in practice."[39] Contribution to the conception thus requires contributing to the inventive idea and a reasonable means or general plan for carrying the idea out; having the idea alone is not enough.[40]

A collaborator who satisfies the contribution standard is a joint inventor and, therefore, also a joint owner of the patent. Joint owners are tenants in common in the patent, each holding an equal, undivided interest in the entire patent.[41] This provides each owner independent rights to make, use, and sell the patented invention.[42] Such owners can assign their rights to others without permission from their co-owners.[43] Consequently, a joint owner cannot grant an exclusive

[38] The first use of the phrase "contribution to the conception" appears to be in *Mueller Brass v. Reading Industries*, 352 F. Supp. at 1357, 1372 (E.D. Pa. 1972). Collaboration does not require joint inventors to work together, but simply that the joint inventors work towards the same end, on the same subject matter, and they produce the invention by their aggregate efforts. Burroughs Wellcome Co. v. Barr Labs., Inc., 40 F.3d 1223, 1227 (Fed. Cir. 1994); Kimberly-Clark v. Proctor & Gamble, 973 F.2d 911, 916-17 (Fed. Cir. 1992).

[39] Trovan, Ltd. v. Sokymat SA, Irori, 299 F.3d 1292, 1302 (Fed. Cir. 2002).

[40] Oka v. Youssefyeh, 849 F.2d 581, 583 (Fed. Cir. 1988); Garrett Corp. v. United States, 422 F.2d 874, 881 (Ct. Cl. 1970) ("One who merely suggests an idea of a result to be accomplished, rather than means of accomplishing it, is not a joint inventor."); Yeda Research & Dev. Co. v. Imclone Sys., Inc., 443 F. Supp. 2d 570, 621-22 (S.D.N.Y. 2006). There remains an ambiguity in joint inventor law concerning whether contribution to the reduction to practice of an invention, but not conception, can satisfy the joint inventor standard in certain circumstances. *Compare* Sewall v. Walters, 21 F.3d 411, 416-17 (Fed. Cir. 1994) (holding reduction to practice can never suffice), *with Pannu*, 155 F.3d at 1351 (holding that reduction to practice can suffice). This ambiguity arose due to an unrecognized effect of the evolution of the meaning of conception in patent priority doctrine, which concerns who among multiple contemporaneous independent inventors is entitled to the patent, on joint inventor law. Joint inventorship should turn on whether a contributor has made a sufficiently inventive contribution to an invention to be entitled to be a joint inventor, assuming all the other requirements are met. Based on this rationale, the appropriate resolution of the reduction to practice ambiguity is to permit a contribution to reduction to practice to satisfy the joint inventor standard where reduction to practice requires sufficient innovation.

[41] 35 U.S.C. § 116 (2006).

[42] 35 U.S.C. § 262 (2006).

[43] Robert Merges & Lawrence Locke, *Co-Ownership of Patents: A Comparative and*

license without the agreement of all co-owners. Joint patent owners need not account to each other for profits made from exploiting or licensing the patent.[44]

Patent infringement lawsuits can only be brought by all patent co-owners unanimously.[45] This rule exists to protect the rights of co-patentees, as a patent can be invalidated in litigation, as well as to protect infringers from multiple lawsuits and to protect licensees from lawsuits by co-owners.[46] Courts, however, are generally reluctant to name co-owners as involuntary plaintiffs, leaving joint owners "at the mercy of each other" in commencing actions for infringement.[47] Each joint owner thus can freely work and license the patent, and each can prevent other co-owners from bringing an infringement suit by refusing to join the suit.

This somewhat extended discussion of the evolution of joint inventor law is provided to demonstrate several points. First, the development of joint inventor doctrine, dating from the common law of the nineteenth century through codification and further judicial development in the twentieth, rarely appears guided or mandated by the underlying subject matter of patent law. Similarly, the development generally does not indicate any correlation with patent law's nonobviousness creativity threshold, the patent owner's substantive rights, or any other expressed differences from copyright doctrine. A relationship between doctrine and subject matter, however, could be hard to ascertain in isolation. The following section turns to copyright law's joint author doctrine for comparison.

B. The Evolution of Joint Author Law

Identical to early patent law, the early Copyright Acts did not explicitly mention joint authorship, but did refer to an "author or authors" obtaining a copyright.[48] The common law of joint authorship grew out of the need to differentiate a composite work (such as a periodical or other compilation), in which different individual authors

Economic View, 72 J. PAT. & TRADEMARK OFF. SOC'Y 586, 588 (1990).

[44] 35 U.S.C. § 262 (2006).

[45] Willingham v. Lawton, 555 F.2d 1340, 1344 (6th Cir. 1977); *see* Ethicon, Inc. v. U.S. Surgical Corp., 135 F.3d 1456, 1468 (Fed. Cir. 1998).

[46] *Willingham*, 555 F.2d at 1344-45.

[47] *Ethicon*, 135 F.3d at 1468. Patent owners generally are only joined involuntarily if they contractually waived their right to refuse to join. Schering Corp. v. Roussel-UCLAF SA, 104 F.3d 341, 345 (Fed. Cir. 1997).

[48] Copyright Act of 1790, ch. 15, 1 Stat. 124 § 1.

hold separate copyrights in their contributions, from a joint work, in which co-authors share rights in the entire work.[49]

American joint authorship law traces its origin to an 1871 English case, *Levy v. Rutley*.[50] In *Levy*, Wilks had written a play and Levy had contributed one scene and made various other alterations.[51] In holding that Levy was not a joint author, the English justices wrote, "There seems to have been no agreement between [Wilks and Levy], or intention on Wilks' part that they should have been joint authors originally."[52] Another Justice agreed, "[T]here is nothing here to show any common design between Wilks and [Levy]."[53] On these bases, the court held that Levy was not entitled to be a joint author. The opinion does not provide any explanation for the common design requirement, though from the text the justices were clearly concerned that a party who contributed only a minor proportion of the whole play should not be entitled to an equal copyright interest.[54]

The first reported American joint author case is a 1915 opinion by Judge Learned Hand involving a dispute over copyright to an opera in which Judge Hand explicitly states that the only joint authorship precedent is *Levy v. Rutley*.[55] Judge Hand adopted the law of *Levy*, holding that joint author rights arise "only when several parties contributed their labor to the production by common and preconcerted design."[56] Judge Hand did not evaluate the merits of adopting *Levy's* intent requirement.

The Second Circuit affirmed Judge Hand's holding, and indicated that joint authorship could arise from the joint conception, joint design, or joint development of a work:

> The pith of joint authorship consists in co-operation, in a common design, and whether this co-operation takes place

[49] 1 MELVILLE B. NIMMER & DAVID NIMMER, NIMMER ON COPYRIGHT § 5.02 (rev. ed. 2010) [hereinafter NIMMER ON COPYRIGHT].

[50] Levy v. Rutley, (1870-71) L.R. 6 C.P. 523 (appeal taken from Eng.).

[51] *Id.* at 524.

[52] WALTER ARTHUR COPINGER, THE LAW OF COPYRIGHT, IN WORKS OF LITERATURE AND ART: INCLUDING THAT OF THE DRAMA, MUSIC, ENGRAVING, SCULPTURE, PAINTING, PHOTOGRAPHY, AND DESIGNS 111 (4th ed. 1904).

[53] *Id.*

[54] *Levy*, 6 C.P. at 525-29.

[55] Maurel v. Smith, 220 F. 195, 199 (S.D.N.Y. 1915) ("I have been able to find strangely little law regarding the rights of joint authors of books or dramatic compositions. The only case in the books in which the matter seems to have been discussed is Levy v. Rutly [sic]."). Similarly, a 1904 patent treatise cites only *Levy* as case law on joint authorship. COPINGER, *supra* note 52, at 109-10.

[56] *Maurel*, 220 F. 195 at 199.

> subsequent to the formation of the design by the one, and is varied in conformity with the suggestions and views of the other, it has equally the effect of creating the joint authorship as if the original design had been their joint conception.[57]

Consistent with dicta from *Levy*, the Second Circuit also held that joint authorship does not require each author to contribute equally.

Judge Hand had a seemingly rare opportunity to affirm his district court–developed intent standard as an appellate judge three decades later when writing for the Second Circuit in *Edward B. Marks Music v. Jerry Vogel Music*.[58] *Marks* concerned a plaintiff who had written the lyrics for a song and sold them to a publisher. The publisher hired another individual to write music for the song, without informing the original lyricist.[59] The court held that it was not necessary for authors to work in concert with each other to produce a joint work, so long as the authors intended their work to be combined into a single whole.[60]

Congress enacted statutory joint author law for the first time in the Copyright Act of 1967, with the explicit intent of codifying the existing common law.[61] Section 101 of the Copyright Act defines a "joint work" as "a work prepared by two or more authors with the intention that their contributions be merged into inseparable or interdependent parts of a unitary whole."[62] The Committee Report on the 1976 Act explained:

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[57] Maurel v. Smith, 271 F. 211, 215 (2d Cir. 1921).

[58] Edward B. Marks Music v. Jerry Vogel Music, 140 F.2d 266, 266 (2d Cir. 1944).

[59] *Id.*

[60] *Id.* at 267. A later Second Circuit decision concerning musical composition, *Shapiro, Bernstein & Co. v. Jerry Vogel Music* (concerning the musical composition "12th Street Rag"), further weakened the intent requirement temporarily. Shapiro, Bernstein & Co. v. Jerry Vogel Music, 221 F.2d 569, 570-71 (2d Cir. 1955). *Shapiro* held that a joint work existed based on the intent of the assignee (not author) of the original work, even though there had been no intent on the part of the original author to produce a joint work at the time of authorship. *Id.* This decision effectively eliminated the requirement of intent at the time of authorship to produce a joint work and was heavily criticized. The Second Circuit later retreated from this expansive holding and restored the standard under *Marks*. Gilliam v. Am. Broad. Inc., 538 F.2d 14, 22 (2d Cir. 1976); Szekely v. Eagle Lion Films, Inc., 242 F.2d 266, 268 (2d Cir. 1957); Picture Music, Inc. v. Bourne, Inc., 314 F. Supp. 640, 646 (S.D.N.Y. 1970), *aff'd*, 457 F.2d 1213 (2d Cir. 1972).

[61] H.R. REP. NO. 94-1476, at 120-21 (1976). The legislative history expressly rejected the defunct 12th Street Rag doctrine and clarified that intent must exist at the time of authorship in order to produce a joint work. *Id.*

[62] 17 U.S.C. § 101 (2006).

> [A] work is "joint" if the authors collaborated with each other, or if each of the authors prepared his or her contribution with the knowledge and intention that it would be merged with the contributions of other authors as "inseparable or interdependent parts of a unitary whole." The touchstone here is the intention, at the time the writing is done, that the parts be absorbed or combined into an integrated unit, although the parts themselves may be either "inseparable" (as the case of a novel or painting) or "interdependent" (as in the case of a motion picture, opera, or the words and music of a song).[63]

As with patent law, the Copyright Act does not define what a joint author is; rather, it only defines a "joint work." In particular, the Act does not identify what level of contribution is necessary or what type of intent is required in order to achieve joint authorship.[64] Defining a joint work as a work prepared by authors "with the knowledge and intention that their contributions be merged into . . . a unitary whole" appears only to require that the authors intend their work to be merged, and does not require an intent to be "joint authors" in the sense of having co-equal interests in the ensuing copyright. Several circuit courts, however, have interpreted the language to require intent to be joint authors in the latter sense.[65] The reasoning provided for this extension is straightforward: providing joint authorship based merely on intent that works be merged "would extend joint author status to many persons who are not likely to have been within the contemplation of Congress."[66] For example, the Second Circuit in the leading joint author case *Childress v. Taylor* notes that both an editor editing a written work and a research assistant providing editorial assistance intend their contributions to be merged into a unitary whole, but neither the primary author nor the person providing assistance intends the latter to be a joint author in the copyright.[67]

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[63] H.R. REP. NO. 94-1476, at 120 (1976).

[64] Roberta Kwall, *"Author-Stories:" Narrative's Implications for Moral Rights and Copyright's Joint Authorship Doctrine*, 75 S. CAL. L. REV. 1, 48 (2001).

[65] Aalmuhammed v. Lee, 202 F.3d 1227, 1234 (9th Cir. 2000); Thompson v. Larson, 147 F.3d 195, 201-02 (2d Cir. 1998); Erickson v. Trinity Theatre, Inc., 13 F.3d 1061, 1068 (7th Cir. 1994); Childress v. Taylor, 945 F.2d 500, 507 (2d Cir. 1991). *Aalmuhammed* concerned an expert on Malcom X and Muslim religion who Spike Lee consulted during production of the movie *Malcolm X*. *Aalmuhammed*, 202 F.3d at 1229. The Ninth Circuit relied on the extent of an individual's control over a work and the degree to which audience appeal turns on each individual's contribution, in addition to intent, in order to determine joint authorship. *Id.* at 1233-35.

[66] *Childress*, 945 F.2d at 507.

[67] *Id.*

Faced with relatively unambiguous statutory language, courts continue to rely, over a century after *Levy*, on their sense of equity to protect the primary producers of artistic works against incursion by secondary contributors.

Though it may seem unsurprising at first glance that courts rely on equitable perceptions to strengthen the intent standard to protect primary authors, it is curious that a similar requirement does not exist in patent law. From Justice Story's initial rendition of the joint inventor standard, through the Supreme Court decisions of the mid-1800s, through the developments and codifications in the twentieth century, there is scant, if any, consideration of an intent requirement to protect primary inventors. Why does equity play out so differently in joint inventor versus joint author decisions?

The patent opinions are equivalent to the copyright decisions in that they contain only relatively simple ad hoc analyses, rarely looking beyond the facts of an instant case, to establish joint inventor standards and rights. The courts clearly believe that it would be unfair to deny joint inventorship when a contributor made an appropriate contribution to an invention, even if joint inventorship was not intended. Particularly in the Supreme Court's *Morse* and *Agawam Woolen* cases, for example, it would have been far easier for the Court to base its decisions on a lack of intent. In each case, the lead inventor did not intend for the other contributors to be joint inventors. Instead of relying on such straightforward analysis, however, the Court delved into the actual technological contributions of the putative joint inventors, getting into rather specific technical detail of the particular inventions in each case to determine that the contributions were not technologically substantial enough to satisfy the joint inventor standard.

The example of the research assistant used in *Childress* highlights the disparate view of who is entitled to intellectual property rights in technological versus artistic endeavors. The court reasoned that even though a research assistant may contribute copyrightable material to the work of a lead author, and there is intent by both parties to produce a joint work, the parties do not intend the research assistant to be a joint author.[68] Therefore, the assistant should not share in any copyright.

The example of a research assistant contributing to a lead researcher, of course, is directly analogous to technological innovation. In fact, this scenario closely resembles the facts of

[68] *Id.*

Ethicon.[69] It is evident from the *Ethicon* opinion that Yoon's (the Ph.D. medical researcher) and Choi's (the electronics technician) intent was similar to that of the *Childress* research assistant hypothetical: both parties intended Choi's contribution to be part of Yoon's work, and neither party (certainly not Yoon) expected Choi to be a joint inventor on the patent. The *Ethicon* court concluded, however, that patent law mandates the opposite result from copyright: intent is irrelevant.[70]

Returning to the development of copyright law, the 1976 Copyright Act, in addition to producing ambiguity concerning the intent requirement, also did not identify whether a contribution had to be independently copyrightable in order to render the contributor a joint author.[71] This led to a famous debate between the two leading copyright treatises concerning whether there should be such a requirement, one arguing for an independent copyrightability standard, the other against it.[72]

Childress is again the leading case. *Childress* concerned an actress who provided a variety of research material, and discussed the inclusion of certain scenes and characters, with a playwright who wrote a play about "the legendary Black comedienne Jackie 'Moms' Mabley."[73] The court referred to requiring independent copyrightability as "troublesome" before noting that, "if the focus is solely on the objective of copyright law to encourage the production of creative works, it is difficult to see why the contributions of all joint authors need to be copyrightable."[74] Contrary to the "objectives of copyright law," however, the court adopted the independent copyrightability requirement for two reasons: to dissuade spurious claims of joint authorship and to strike a balance between copyright and contract, as in the absence of a contract, the copyright would remain with the person who created the copyrightable material.[75]

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[69] Ethicon Inc. v. U.S. Surgical Corp., 135 F.3d 1456, 1458 (Fed. Cir. 1998).

[70] *Id.* at 1468.

[71] Kwall, *supra* note 64, at 48-49.

[72] 1 PAUL GOLDSTEIN, COPYRIGHT: PRINCIPLES, LAW AND PRACTICE § 4.2.1.2 (1989); 1 NIMMER ON COPYRIGHT, *supra* note 42, at § 6.07 (arguing against independent copyrightability requirement).

[73] *Childress*, 945 F.2d at 501-02.

[74] *Id.* at 506.

[75] *Id.* at 507. At first glance, the reasoning in *Childress* may appear to contradict partially the thrust of this Article, as the court at least considers the goals of the copyright system. Scratching the surface, however, renders such a claim questionable. The court itself acknowledges that the first reason offered is particularly weak, as someone seeking to assert a spurious claim could also easily claim to have contributed copyrightable material. *Id.* at 507. The standard for originality is so low that it is hard

Following *Childress*, a number of other circuit and district courts considered the question of independent copyrightability.[76] Every court followed *Childress*' lead, generally without reconsidering the analysis.[77] Where a court did engage in independent analysis, it was again relatively superficial and based on equitable perceptions.[78]

The *Childress* decision thus develops two requirements (independent copyrightability and intent to be joint authors) that are not mandated by the Copyright Act,[79] which combined result in doctrine that strongly favors the award of copyright to sole (and primary) authors rather than including joint (and secondary) authors. All circuit courts that have considered the question have reached the same result without any explanation for why sole authorship should be favored over joint authorship, or why primary authors should be favored to the exclusion of secondary authors, other than stating that the contrary results would be unfair.[80]

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to imagine how the independent copyrightability standard could block many spurious claims. *See, e.g.*, Feist Publ'ns, Inc. v. Rural Tel. Serv., 499 U.S. 340, 345 (1991) ("[T]he requisite level of creativity is extremely low; even a slight amount will suffice."). The second reason proffered in *Childress* is explicitly based on an ad hoc reaction about fairness; the court does not explore why the default rule should exclude a secondary contributor. *Childress*, 945 F.2d at 507.

[76] *See supra* note 65.

[77] Aalmuhammed v. Lee, 202 F.3d 1227, 1231 (9th Cir. 2000); Erickson v. Trinity Theatre Inc., 13 F.3d 1061, 1068 (7th Cir. 1994); M.G.B. Homes, Inc. v. Am. Homes, Inc., 903 F.2d 1486, 1492-93 (11th Cir. 1990). One district court had reached an alternate conclusion prior to *Childress*, based on dicta in a circuit court opinion, but no court has disagreed with the Second Circuit since *Childress*. *See* Cmty. for Creative Non-Violence v. Reid, 846 F.2d 1485, 1496 (D.C. Cir. 1988) (noting in dicta that "one may qualify as a joint author even if his contribution, 'standing alone would not be copyrightable,' " based on 1 MELVILLE B. NIMMER & DAVID NIMMER, NIMMER ON COPYRIGHT § 6.03, at 6-6 and § 6.17, at 6-18 (rev. ed. 1985)); Neva, Inc. v. Christian Duplications, Int'l, Inc., 743 F. Supp 1533, 1545-46 (M.D. Fla. 1990) (requiring only de minimis contribution (and intent) to be joint author).

[78] *See, e.g.*, Clogston v. Am. Acad. of Orthopaedic Surgeons, 930 F. Supp. 1156, 1159 (W.D. Tex. 1991) (asserting that *Childress* rule "strikes the proper balance between the rights of contributors and rights of authors").

[79] *Childress*, 945 F.2d at 506-07 (recognizing that decision is not mandated by language of Copyright Act).

[80] The intent and independent copyrightability requirements have been retained, even in the face of a resulting paradox. Where a junior author makes an independently copyrightable contribution to a work primarily developed by a senior author, but the parties lack the requisite intent for joint authorship, the copyright status of the junior author's contribution remains unresolved. This issue was raised in *Thompson v. Larson*, concerning a dramaturg who collaborated on *Rent*, the Pulitzer Prize and Tony Award-winning Broadway musical. Thompson v. Larson, 147 F.3d 195, 196 (2d Cir. 1998). The court held that the dramaturg had made an independently copyrightable contribution, but that the principal playwright, Jonathan

As with joint inventors under patent law, joint authors are tenants in common in the copyright, each co-owner having an equal, undivided right to use and license the copyrighted work.[81] This gives each owner the rights to copy, distribute, prepare derivative works, grant nonexclusive licenses, and exercise other rights in the work.[82] Unlike patent law, joint copyright owners can independently commence actions for infringement against third parties without joining the other co-owners.[83]

Also unlike patent law, each copyright co-owner has a duty to account to other co-owners for any profits from using or licensing the copyright.[84] This requirement is not mandated in statute, but by common law based on "equitable doctrines relating to unjust enrichment and general principles of law governing the rights of co-owners."[85] Such reasoning would seem to apply equally in the patent context, but the Patent Act (codifying prior common law) explicitly states that joint owners do not have a duty to account, absent an agreement to the contrary.[86]

As with joint inventor law, neither the common law nor statutory development of joint author doctrine suggests any reliance on the underlying subject matter of copyright law (artistic works), the creativity threshold for copyright protection (originality), or other copyright doctrine. Critically, even though joint author law developed long after joint inventor law, there is no indication that judges and lawmakers playing a role in the evolution of joint author doctrine ever

Larson, had not intended her to be a joint author. *Id.* at 200-05. Thompson argued that the only alternative to joint authorship was to split the work into its component sources, with Thompson entitled to copyright in her contribution. Larson's heirs (Larson was deceased at the time of the suit) contended that absent joint authorship, the principal author retained copyright in the entire work, and the junior author could not withdraw her contribution. *Id.* at 205-06. The Second Circuit did not reach this issue (it had not been presented to the district court), and the case subsequently settled. The status of such a contribution remains unsettled.

[81] 17 U.S.C. § 201(a) (2006).

[82] Gary H. Moore, *Joint Ventures and Strategic Alliances: Ownership of Developed Intellectual Property — Issues and Approaches*, *in* HANDLING INTELLECTUAL PROPERTY ISSUES IN BUSINESS TRANSACTIONS 2007, at 187, 216 (PLI Patents, Copyrights, Trademarks, and Literary Prop., Course Handbook Ser. No. 893, 2007).

[83] 17 U.S.C. § 501(b) (2006).

[84] Richlin v. Metro-Goldwyn-Mayer Pictures, Inc., 531 F.3d 962, 967 (9th Cir. 2008); *Thompson*, 147 F.3d at 199.

[85] Oddo v. Ries, 743 F.2d 630, 633 (9th Cir. 1984).

[86] 35 U.S.C. § 262 (2006). Congress did expressly acknowledge the judicially created accounting rule for joint authors when adopting the Copyright Act in 1976. H.R. REP. NO. 94-1476, at 121 (1976).

paid attention to the potential relevance of joint inventor law, either as a base to emulate or to evade. Similarly, there is nothing in over a century's worth of history of joint inventor law development that overlaps with joint author law to indicate adherence to or avoidance of copyright developments. In short, the joint creator doctrines appear to have evolved remarkably independently and without recognition of each other.

Professor John Wiley has conducted what is likely the most extensive analysis of the functional reasons that could explain the differences between copyright and patent law.[87] In addition to some of the bases noted and refuted above, he also identifies the different administrative procedures, manner in which rights arise, and volume of protectable production as possible explanations for the dissimilarities between patent and copyright doctrine.[88] None of these differences appear to explain the variation between joint author and joint inventor law either. Similarly, recent attempts to explain intellectual property law from cultural perspectives, as opposed to economic or natural rights perspectives, do not explain the disparities between joint author and joint inventor law.[89]

Study of the historic development of joint inventor and joint author law thus indicates that the differences between the doctrines do not result from the common explanatory sources concerning subject matter, creativity thresholds, or differences in rights. Viewed through this perspective, the thesis that joint creator doctrine is based in part on stereotyped myths about artistic and scientific creativity becomes substantially more plausible. It would not be surprising that a judge (or legislator) developing legal doctrine in the absence of a clear context might turn to his or her own understanding of how authors create and inventors invent. Analyzing whether the law could have evolved differently further strengthens this conclusion.

C. Examining Alternate Worlds

Those who are skeptical of this Article's thesis may be doubtful that joint author and joint inventor doctrine are so malleable, in some

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[87] *See generally* Wiley, *supra* note 3 (analyzing differences between copyright and patent laws).

[88] *Id.* at 181-82. Wiley also identifies the alleged different characters of the creative processes involved, a difference that has now been discredited. *See infra* Part II.C.

[89] *See, e.g.*, Jessica Sibley, *The Mythical Beginnings of Intellectual Property*, 15 GEO. MASON L. REV. 319 (2008) (arguing that intellectual property protection is rooted in narrative theory, but not explaining how that source could produce such disparate doctrines).

sense, that stereotypes of creativity could direct the law. Such a contrary opinion would likely contend that joint creator law must have evolved more intentionally or efficiently to reach its present state, or that the differences between joint inventor and joint author doctrine arise out of necessity based on the different patent and copyright systems. This position can actually be tested, and refuted, in several manners: first, by examining the efficiency of current joint creator doctrine based on common metrics; second, by analyzing the effect of shifting standards in intellectual property over time; and third, by considering the potential for transposing joint creator standards in their counterpart areas of law.

1. The Economic Inefficiency of Joint Creator Doctrine

Certain law and economics accounts of common law development predict that the law will evolve towards efficiency.[90] Under a basic version of this model, inefficient legal rules create costs for parties, who therefore have incentives to litigate and modify such rules. As more efficient legal rules are established, the incentives to modify the rules get reduced.[91]

If the efficiency hypothesis is correct for joint author and joint inventor law, then these doctrines, having evolved for a century or two, respectively, should provide terms for dividing joint creator rights in a manner that the parties involved would tend to agree to in the first instance.[92] This is not the case. Both joint inventor and joint author law currently provide joint creators with equal, undivided interests in the intellectual property produced, regardless of the relative contribution of each party. In actual transactions, however, parties rarely contract for equal interests in prospective intellectual property, particularly when contributions are not expected to be equal. For example, employees routinely assign away all rights in prospective inventions in exchange for employment, and putative co-authors routinely enter contracts that do not divide rights equally.[93]

[90] *See* Ronald Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 9 (1960) (indicating concept of efficiency in evolution of common law); Isaac Ehrlich & Richard Posner, *An Economic Analysis of Legal Rulemaking*, 3 J. LEGAL STUD. 257, 275 (1974) (developing efficiency in evolution of common law thesis).

[91] RICHARD POSNER, ECONOMIC ANALYSIS OF LAW 97, 99 (Vicki Been et al. eds., 7th ed. 2007).

[92] *Id.*; Ian Ayres & Robert Gertner, *Filling Gaps in Incomplete Contracts: An Economic Theory of Default Rules*, 99 YALE L.J. 87, 87-90 (1989).

[93] *See, e.g.*, Ga.-Pac. Corp. v. Lieberam, 959 F.2d 901, 904-06 (11th Cir. 1992) (invention agreement contract assigns all ownership rights to employer); Abbott Marie

Economic analysis of law does provide that, in certain circumstances, efficient law is not that which the parties would have agreed to. Professors Ayres and Gertner famously explained that "penalty" default rules are more efficient in certain contexts, in particular for our purposes when rules should be designed to resolve problems of asymmetrical information between the parties.[94] In such situations, penalty default rules can efficiently incentivize a more informed party to reveal information to a less informed party.[95]

Joint creator laws, however, do not fit the model for penalty default rules. Under joint author law, it is the dominant author who controls the asymmetrical information (his or her own intent concerning joint authorship), but the current default rule places the penalty on the nondominant contributor, who receives no copyright interest if the dominant author did not intend so. Conversely, under joint inventor law, the potential penalty is placed on the lead researcher, who may potentially be forced to give up equal rights to a minor contributor, but it is entirely unclear that such an inventor possesses any information that should be revealed. Joint creator law thus is not explained by traditional economic theory that the law will evolve towards efficiency or can be used to resolve asymmetrical information problems.

2. Shifting Creativity Standards

A seldom noted twist in patent and copyright development involves the inversion of patent and copyright creativity standards over time. This inversion provides further evidence that the different joint inventor and joint author doctrines do not result from differing creativity thresholds. When Congress first enacted the Patent Act in 1790 it contained only two substantive standards for patentability: utility and novelty.[96] There was no nonobviousness requirement. In 1851, the Supreme Court in *Hotchkiss v. Greenwood* established the

Jones, *Get Ready Cause Here They Come: A Look at Problems on the Horizon for Authorship and Termination Rights in Sound Recordings*, 31 HASTINGS COMM. & ENT. L.J. 127, 128 (2008) (explaining that recording contracts routinely assign all or initial rights in recording company).

[94] Ayres & Gertner, *supra* note 92, at 97.

[95] *Id.* at 97-98. Penalty default rules can also be used to incentivize both parties to provide more information to third parties, such as the courts. *Id.*

[96] Act of Apr. 10, 1790, ch. 7, § 1, 1 Stat. 109, 110. The Act did require an invention to be "sufficiently useful and important," but the "important" language was never used to create an independent requirement for patentability. Duffy, *supra* note 3, at 34.

precursor to the current statutory nonobviousness standard.[97] The Court held that the subject matter at issue was not patentable because it did not require

> more ingenuity and skill . . . than were possessed by an ordinary mechanic acquainted with the business, there was an absence of that degree of skill and ingenuity which constitute essential elements of every invention. In other words, the improvement is the work of the skillful mechanic, not that of [an] inventor.[98]

This new "invention" requirement raised the creativity standard for patentability and would evolve into the current nonobviousness standard, as codified in 1952.[99]

Conversely to the development of patent law, copyright law originally had a higher creativity threshold than it does now. In *Jollie v. Jacques*, a case decided one year prior to *Hotchkiss* and authored by the same justice, the court denied a copyright injunction for a musical composition titled "The Serious Family Polka" for a lack of originality.[100] The court juxtaposed the standard for originality for a copyright against what "a mere mechanic in music" could achieve.[101] A work eligible for copyright protection must "be substantially . . . new and original . . . and not a copy of a piece already produced, with additions and variations, which a writer of music with experience and skill might readily make."[102]

The creativity thresholds for patent and copyright were thus remarkably similar for a period of time in the 1800s, each requiring more ingenuity and skill than that of an ordinarily skilled artisan in the pertinent field to receive intellectual property protection.[103] Patent law raised its standard from an earlier novelty threshold to reach this requirement, a shift that copyright law followed in reverse in

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[97] Hotchkiss v. Greenwood, 52 U.S. 248, 266-67 (1851). Prior to 1851, something more than pure novelty (as understood today) was required to receive a patent, as trivial changes in form were considered non-novel. Edmund W. Kitch, Graham v. John Deere Co.: *New Standards for Patents*, 1966 SUP. CT. REV. 293, 303-09 (1966).

[98] *Hotchkiss*, 52 U.S. at 267.

[99] 35 U.S.C. § 103(a) (2006).

[100] Jollie v. Jacques, 13 F.Cas. 910, 911, 914 (C.C.S.D.N.Y. 1850) (No. 7,437).

[101] *Id.* at 913.

[102] *Id.* at 914.

[103] *See* Joseph Miller, *Hoisting Originality*, 31 CARDOZO L. REV. 451, 458, 472 (2009) (discussing similarity of patent and copyright standards in *Hotchkiss* and *Jacques*).

subsequent years. The results are the current disparate creativity thresholds, nonobviousness in patent law, and originality in copyright.

Joint inventor doctrine arose prior to patent law's invention and nonobviousness requirements, at a time when patent law's creativity threshold was akin to the current copyright standard. The later elevation of patent law's creativity standard did not necessitate any corresponding change in joint inventor doctrine. That patent and copyright doctrines are flexible enough to incorporate significant shifts in their respective creativity thresholds, without any corresponding need to modify joint creator law, indicates that joint creator doctrine is not dependent upon the creativity standards.

3. Patents in the School of Copyright, and Vice-Versa

To evaluate whether inherent differences in the patent and copyright systems produce the existing discrepancies in joint creator law, one also can analyze whether there are viable alternatives to current joint creator doctrine. To the extent that the current standards from one system, patent, or copyright could practically be applied in the alternate area of intellectual property, this is strong evidence that the differences are not necessitated by differing subject matter, creativity thresholds, or other rights.

It is relatively evident that either system could function with (or without) an intent requirement.[104] The more challenging question concerns whether patent law's elevated creativity threshold dictates the differences in joint creator law concerning independent copyrightability (required) versus independent patentability (not required). Consider that two individuals each make a contribution to an ultimately nonobvious joint invention. There are three possible relationships between the contributors and the creativity of their contributions: (1) that each made a nonobvious contribution to the nonobvious joint invention, (2) that one made a nonobvious and the other an obvious (but not insignificant) contribution to the nonobvious joint invention, and (3) that each made an obvious contribution, that, when combined, produced a nonobvious joint invention.

None of these alternatives necessitate the absence of an "independent patentability" requirement for joint inventor law. Under the first, whether the independent patentability rule exists or not is

[104] All that is being considered here is basic functionality. Whether, and what type of, intent requirement is efficient or equitable is considered in later sections. *See infra* Part III.

irrelevant: the two contributors will each be entitled to joint inventorship regardless. Under the second scenario, an independent patentability requirement would change the outcome from current doctrine (the person who made the nonobvious contribution would be a sole inventor instead of sharing joint rights), but this result would simply parallel copyright law and is at least facially justifiable for the same reason that copyright law is — one contributor has made a qualitatively more important contribution. The third scenario appears to be logically impossible. Nonobvious advances are those that "would not have been obvious . . . to a person having ordinary skill in the art."[105] Under this scenario, the contributions only involve improvements that are obvious to persons of ordinary skill. Multiple contributions, each obvious to a person of ordinary skill, cannot produce a collective result that is nonobvious. If each contribution is obvious, but their combination is nonobvious, then whoever conceived of the combination made the nonobvious contribution.[106] Though this account of invention is somewhat abstract, and does not capture every real world nuance, it indicates that it is feasible for joint inventor law to require an independently patentable contribution, just as joint author law requires independent copyrightability.

Patent law's grant of an equal, undivided interest in the entire patent to a joint inventor who contributes to only one claim also is not necessary, as noted by Judge Newman in her dissent in *Ethicon*.[107] Judge Newman interpreted the 1984 amendments to § 116 to apply only to joint inventorship, not joint ownership.[108] In Judge Newman's view, § 116 merely allowed anyone who had contributed to the conception of a single claim to be named on the patent document as a joint inventor, but this did not entitle each such joint inventor to an equal, undivided interest in the entire patent.[109] Rather, a joint inventor's rights could be limited to the claims to which he or she contributed.

Just as joint inventor law could mirror joint author law, joint author law could also mirror joint inventor law. Rather than the independent copyrightability standard, a lesser contribution to the development a joint work could be sufficient, as Professor Melville Nimmer famously

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[105] 35 U.S.C. § 103(a) (2006).

[106] *See* KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 419 (2007) (discussing when insight to combine various prior art references is nonobvious).

[107] Ethicon Inc. v. U.S. Surgical Corp., 135 F.3d 1456, 1468 (Fed. Cir. 1998) (Newman, J., dissenting).

[108] *Id.* at 1470.

[109] *Id.*

argued for years.[110] So too, copyright law need not require intent to be joint authors, as criticism of *Childress* and its progeny reveals.[111] Instead, copyright law could require, akin to patent law, a "not insignificant" contribution, which was not available in the public domain, to an original aspect of a work in order to be a joint author. In sum, the patent system could function with copyright-type rules for joint inventorship, and the copyright system could function with patent-type rules of joint authorship. The possibility of such transposed doctrine indicates that the doctrinal differences in joint creator law do not derive from any inherent differences between the patent and copyright systems.

D. Comparative Joint Creator Law

Comparative examination of foreign joint creator law provides a further demonstration that American joint creator doctrine is not mandated by the differences between patent and copyright. Although many components of foreign and American patent and copyright systems are significantly harmonized,[112] other countries' joint creator doctrines differ significantly from the United States'. In particular, foreign joint author and joint inventor laws are often more internally parallel, indicating that the American divergence is not necessary.

The greatest discrepancy between American and foreign joint creator laws is that almost no other country follows the American standard for joint authorship requiring intent to be a joint author. Most countries have no intent requirement for joint authorship at all. Rather, joint authorship is usually defined functionally: when the contributions of multiple authors cannot be separated out, then the contributors are joint authors, regardless of intent.[113] Canada is

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[110] 1 MELVILLE B. NIMMER & DAVID NIMMER, NIMMER ON COPYRIGHT § 6.07, 6-21 (rev. ed. 1991).

[111] *See* Rochelle Dreyfuss, *Collaborative Research: Conflicts on Authorship, Ownership, and Accountability*, 53 VAND. L. REV. 1161, 1208 (2000); Kwall, *supra* note 64, at 55.

[112] *See, e.g.*, INTERNATIONAL COPYRIGHT LAW AND PRACTICE (Melville B. Nimmer & Paul E. Geller eds., 2007) (detailing similarities in copyright law throughout world); Gregory N. Mandel, *Regulating Nanotechnology Through Intellectual Property Rights*, *in* INTERNATIONAL HANDBOOK ON REGULATING NANOTECHNOLOGIES 388 (Graeme Hodge et al. eds., forthcoming 2010) (discussing similarities in patent validity requirements throughout world).

[113] *E.g.*, 著作権法 [Copyright Act], Law No. 48 of 1970, art. 2(xii), *translated in* http://www.japaneselawtranslation.go.jp/law/detail/?id=56&vm=04&re=02&new=1 (Japan); JAMES & WELLS INTELLECTUAL PROPERTY, JAMES & WELLS INTELLECTUAL PROPERTY LAW IN NEW ZEALAND 194 (Ian Finch ed., 2007); S. Ramaiah, *India*, *in* 2

perhaps the only other country with an intent requirement similar to that of the United States.[114]

There is also variation in the independent copyrightability requirement of joint authorship. Britain, for example, requires a "significant and original contribution," but this contribution need not rise to the level of independent copyrightability.[115] Japanese law provides for joint authorship when "the contribution of each person cannot be separately exploited," again, regardless of independent copyrightability.[116] The German copyright act applies the same requirement as Japan.[117] China has an analogous rule, providing that the ability to separately exploit a work entitles each author to a separate copyright in his or her contribution, but not if exercising such separate rights would "prejudice the copyright in the joint work as a whole."[118]

Foreign law on the requirements of joint inventorship varies from American law as well. Both Australia and South Korea apply lower substantive standards for joint inventorship than in the United States. In Australia, individuals are entitled to joint inventorship if their contribution "had a material effect on the final concept of the invention."[119] "Material effect" can be satisfied by: (1) solving a problem the inventor did not recognize, (2) solving a recognized problem that the inventor could not solve, or (3) producing an advantage the primary inventor did not contemplate.[120] South Korea includes not just those who contributed to the conception of an invention as joint inventors, but also those who contributed to

INTERNATIONAL COPYRIGHT LAW AND PRACTICE, *supra* note 112, at § 4(1)(a).

[114] Neudorf v. Nettwerk Prod. Ltd., [1999] B.C.T.C. 5, 10-11 (Can.).

[115] Lionel Bentley & William Cornish, *United Kingdom*, *in* 2 INTERNATIONAL COPYRIGHT LAW AND PRACTICE, *supra* note 112, at § 4(1)(a)(i); PASCAL KAMINA, FILM COPYRIGHT IN THE EUROPEAN UNION 143-44 (2002).

[116] 著作権法 [Copyright Act], Law No. 48 of 1970, art. 2(xii), *translated in* http://www.japaneselawtranslation.go.jp/law/detail/?id=56&vm=04&re=02&new=1 (Japan). In Japan, a lyricist and composer who develop a song together will not own a joint copyright, as each contribution can be exploited on its own. PETER GANEA ET AL., JAPANESE COPYRIGHT LAW 33 (2005).

[117] Urheberrechtsgesetz [UrhG] [Copyright Law], Sept. 9, 1965, art. 8(1) (Ger.), *translated in* http://www.iuscomp.org/gla/statutes/UrhG.htm#8.

[118] 中华人民共和国著作权法 [Copyright Law], art. 13 (China), *translated in* http://www.fdi.gov.cn/pub/FDI_EN/Laws/GeneralLawsandRegulations/BasicLaws/P020100310354970932477.

[119] *Row Weeder Pty. v. Nielsen*, (1997) 39 IPR 400 (Austl. 1998).

[120] *Id.*

"activities that led to [the] conception."[121] South Korean joint inventors would include a manager who completes an invention by adding a new idea to another researcher's experiments or a person who completes another person's research and invention.[122] It appears likely, for example, that the employees in *Agawam Woolen* would have qualified as joint inventors in Australia and South Korea, contrary to their exclusion from joint inventorship in the United States.

Some countries provide joint inventor requirements that are close to the American standard. Japan has a comparable, though not identical, requirement of "substantial cooperation" in the "creation of technical ideas" for joint inventorship.[123] A number of other countries provide a standard effectively the same as the United States, requiring a contribution to the "inventive concept" of the invention.[124]

In addition to varying requirements for establishing joint creator rights, foreign jurisdictions also vary widely in the rights that joint inventors and joint authors have vis-à-vis their co-inventors and co-authors. Switzerland and South Africa provide a striking difference, requiring unanimous consent among joint inventors to exploit a patented invention.[125] In almost all other countries, a joint inventor may exploit a patent itself (as in the United States), but does not have the right to license the patent to a third party absent the consent of all joint owners (contrary to the United States).[126] Some European countries and Japan prohibit patent co-owners from transferring their

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[121] Kevin Lee & Tae Jun Suh, *Korea: A Question of Ownership*, *in* ASIA PACIFIC IP FOCUS 2007 SUPPLEMENT TO MANAGING INTELLECTUAL PROPERTY (2007), *available at* http://www.managingip.com/Article/1450518/Korea-A-question-of-ownership.html.

[122] *Id.* (citing definition of joint inventor appearing in Korean Intellectual Property Office booklet).

[123] Mary LaFrance, *A Comparative Study of United States and Japanese Laws on Collaborative Inventions, and the Impact of those Laws on Technology Transfers*, 2005 INST. INTELL. PROP. BULL. 86, 88 (quoting YOSHIFUJI & KUMAGAI, TOKKYO HOU GAISETSU (OVERVIEW OF PATENT LAW) 187-89 (rev. 13th ed., 1998)).

[124] *E.g.*, Rhone-Poulenc Rorer Int'l Holdings Inc. v. Yeda Res. & Dev. Co. Ltd., [2007] UKHL 43, [2008] R.P.C. (H.L.) 10 (appeal taken from Eng.); Apotex Inc. v. Wellcome Found. Ltd., [2002] 4 S.C.R. 153, 156 (Can.).

[125] South Africa Patents Act 57 of 1978 § 49(2) (as amended by Patent Amendments Act 58 of 2002), *available at* http://www.wipo.int/wipolex/en/text.jsp?file_id=181330; AIPPI, COMMITTEE NO. Q194: THE IMPACT OF CO-OWNERSHIP OF INTELLECTUAL PROPERTY RIGHTS ON THEIR EXPLOITATION 4, Oct. 2009, (Switz.), *available at* https://www.aippi.org/download/comitees/194/GR194switzerland.pdf.

[126] Moore, *supra* note 82, at 213; *e.g.*, 著作権法 [Copyright Act], Law No. 48 of 1970, art. 64, *translated in* http://www.japaneselawtranslation.go.jp/law/detail/?id=56&vm=04&re=02&new=1 (Japan); JAMES & WELLS, INTELLECTUAL PROPERTY, *supra* note 113, at 33-34.

ownership rights without unanimous consent of the other co-owners.[127] Other countries, such as China and Brazil, permit joint inventors to transfer their ownership interests independently, but provide other joint inventors with a right of first refusal in the transferor's interest.[128] A few countries, including France and Germany, require joint owners to account to each other for profits received from exploiting a patent individually.[129] Many foreign jurisdictions permit co-owners to enforce their patent rights independently, unlike the United States.[130]

Most foreign jurisdictions require unanimous consent among all joint authors in order to exploit a copyrighted work, such as to distribute copies of the work.[131] Similarly, in most foreign jurisdictions joint authors may not independently license their copyright to third parties, but must achieve unanimous consent to do so, unlike in the United States.[132] Brazil takes an in-between approach, permitting a majority of joint authors to decide how to exploit a work.[133] Most other jurisdictions require unanimous consent in order for a joint author to transfer his or her ownership interest.[134]

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[127] Merges & Locke, *supra* note 43, at 590.

[128] AIPPI, COMMITTEE NO. Q194: THE IMPACT OF CO-OWNERSHIP OF INTELLECTUAL PROPERTY RIGHTS ON THEIR EXPLOITATION 3, Oct. 2009, (China), *available at* https://www.aippi.org/download/comitees/194/GR194china.pdf; AIPPI, COMMITTEE NO. Q194: THE IMPACT OF CO-OWNERSHIP OF INTELLECTUAL PROPERTY RIGHTS ON THEIR EXPLOITATION 3, Oct. 2009, (Braz.), *available at* https://www.aippi.org/download/comitees/194/GR194brazil.pdf [hereinafter *AIPPI Brazil*] (citing Civil Code of Brazil art. 1322).

[129] Merges & Locke, *supra* note 43, at 590-91.

[130] *E.g.*, *AIPPI Brazil*, *supra* note 128, at 3; AIPPI, COMMITTEE NO. Q194: THE IMPACT OF CO-OWNERSHIP OF INTELLECTUAL PROPERTY RIGHTS ON THEIR EXPLOITATION 3, Oct. 2009 (Den.), *available at* https://www.aippi.org/download/comitees/194/GR194denmark.pdf.

[131] David Marchese, *Joint Ownership of Intellectual Property*, 21 EUR. INTELL. PROP. REV. 364, 367 (1999); *e.g.*, Law No. 82 of 2002 (Law on the Protection of Intellectual Property Rights), 3 June 2002, art. 174 (Egypt) (discussing if it is "impossible to distinguish the contribution of each in the joint work"), *available at* http://www.wipo.int/wipolex/en/text.jsp?file_id=190001; AIPPI, COMMITTEE NO. Q194: THE IMPACT OF CO-OWNERSHIP OF INTELLECTUAL PROPERTY RIGHTS ON THEIR EXPLOITATION 3, Oct. 2009 (Japan), *available at* https://www.aippi.org/download/comitees/194/GR194japan.pdf.

[132] Moore, *supra* note 82, at 218.

[133] Manoel J. Pereira dos Santos & Otto B. Licks, *Brazil*, *in* 1 INTERNATIONAL COPYRIGHT LAW AND PRACTICE, *supra* note 112, at § 4(1)(a)(i).

[134] *E.g.*, AIPPI, COMMITTEE NO. Q194: THE IMPACT OF CO-OWNERSHIP OF INTELLECTUAL PROPERTY RIGHTS ON THEIR EXPLOITATION 3, Oct. 2009 (Can.), *available at* https://www.aippi.org/download/comitees/194/GR194canada.pdf. See also the AIPPI group reports for Egypt, Germany, India, Japan, Russia, Singapore, and South Africa.

This brief survey of comparative copyright and patent law demonstrates that jurisdictions vary widely in their standards of joint authorship and joint inventorship, and in the substantive rights of joint authors and joint inventors. This variation exists despite an overall uniformity in the underlying patent and copyright systems and provides further evidence that current scholarly attempts to explain the differences in American joint creator law based on differences between copyright and patent subject matter are unsuccessful.[135] In combination, the historical, textual, conceptual, and comparative analyses presented here provide a wealth of data to buttress this conclusion. The traditional explanatory account of the differences between patent and copyright, at least with respect to joint inventor and joint author law, appears to be misconceived.

II. CREATIVITY STEREOTYPES AS AN EXPLANATORY MODEL OF INTELLECTUAL PROPERTY

If the differences in joint creator law do not arise from the commonly accepted causes, then what is their source? One explanation consistent with the doctrines and their historical development is that the differences arose, at least in part, as a result of common biases in differing sociocultural perceptions of the creativity and creative processes that produce technological innovation versus artistic expression.[136] Whether lawmakers articulate it or not, they likely share the common social view that artistic and inventive creativity arise from fundamentally different cognitive processes, and this perception has influenced the law.

This is not to claim that stereotypes about creativity are the sole cause of the myriad differences between copyright and patent law. Doctrines that developed over centuries have multivariate sources. Prejudices concerning the creativity of artists versus scientists do appear, however, to be a significant, and previously unrecognized, cause of many of the legal differences in these areas. Simply put, such prejudices better explain divergence between certain patent and copyright doctrines, particularly including joint creator law, than do any of the traditional explanations. Unfortunately, as with most prejudices, social stereotypes of creativity present substantially inaccurate portrayals of the actual modes of ingenuity in the arts and

[135] That there is overall uniformity does not mean, of course, that there is complete uniformity. One area of disparity is already discussed in this article — moral rights. *See infra* Part II.A.2.

[136] *See infra* Part II.A.

sciences, and these particular inaccuracies can detrimentally affect the opportunity for intellectual property law to promote creativity.

This Part begins with a discussion of common stereotypes concerning artistic and inventive creativity, followed by a discussion of common stereotypes concerning the relationship between artists or inventors and their works. Four lines of evidence, elaborated in the second section of this part, support the hypothesis that creativity stereotypes have influenced the law: first, creativity stereotypes map remarkably consistently onto actual differences between joint inventor and joint author law; second, the text of judicial opinions reveal influences of the stereotypes; third, a comparative cultural and legal analysis is consistent with stereotype-driven doctrine; and fourth, the temporal evolution of differing conceptions of creativity matches the evolution of joint creator legal doctrine.

A. Stereotypes of Inventive and Artistic Creativity

Researchers in a variety of fields have studied social stereotypes concerning artistic versus inventive creativity. Similarly, scholars have elaborated differences in stereotypes concerning the association between artists versus inventors and their respective works.

1. Left-Brain versus Right-Brain Creativity Stereotypes

The notion that different hemispheres of the brain serve different functions arose in the nineteenth century when researchers discovered that similar injury to opposite sides of the brain impaired function differently.[137] Beliefs concerning left-brain/right-brain hemispheric differentiation increased over time as scientists discovered more about the biology, and then the neurobiology, of the brain.

Most thinking, sensation, and perception take place in the cerebral cortex, the heavily folded outer layer of the brain.[138] The cerebral cortex is divided into two hemispheres, the left and the right. These hemispheres have many overlapping functions, but also display some asymmetries.[139] The left side of the brain is more dominant for language activities, while the right side is more dominant for visuospatial function, ranging from object perception to dance.[140] An

[137] JOHN DACEY & KATHLEEN LENNON, UNDERSTANDING CREATIVITY: THE INTERPLAY OF BIOLOGICAL, PSYCHOLOGICAL, AND SOCIAL FACTORS 205 (1998); SALLY SPRINGER & GEORG DEUTSCH, LEFT BRAIN, RIGHT BRAIN 13-14 (1985).

[138] DACEY & LENNON, *supra* note 137, at 202.

[139] *Id.* at 203-05.

[140] *Id.*; JAMES IACCINO, LEFT BRAIN-RIGHT BRAIN DIFFERENCES: INQUIRIES, EVIDENCE,

injury to the left-side of the brain, for example, might severely impact language function, while the same injury to the right side might not.

This demonstrated difference in hemispheric function led to speculation by various experts about a wide variety of differences between the roles of the left-brain versus the right-brain, mostly concerning creative function, and often based on little evidence.[141] The left hemisphere of the brain became associated with more logical, rational, and sequential thought processes, while the right hemisphere was associated with more intuitive, emotional, and abstract thought.[142] This differentiation analysis grew rampant in the latter part of the twentieth century. One author collected twenty different commonly used dichotomous labels ascribing different types of creative function to each hemisphere.[143]

The concept of hemispheric dominance reinforced the notion of hemispheric differentiation. Hemispheric dominance refers to the fact that most people develop a preference for using one side of their body (one hand, one foot, one eye) over the other, and that functioning on one side of the body is controlled by the brain hemisphere on the opposite side.[144] As most people are right-handed (and right-footed and right-eyed), it became commonly believed that most people are left-brain dominant.[145]

The perceived dichotomy between left-brain and right-brain creativity produced differentiation between artistic and scientific

AND NEW APPROACHES 7-10 (1993); Philip Vernon, *Intelligence*, *Cognitive Styles*, *and Brain Lateralization*, 19 INT'L J. PSYCHOL. 435, 440 (1984). There may also be chemical differences between the hemispheres that produce cognitive, emotional, and behavioral asymmetries. DACEY & LENNON, *supra* note 137, at 203-05.

[141] DACEY & LENNON, *supra* note 137, at 203; R.M. RESTAK, THE BRAIN HAS A MIND OF ITS OWN 37-38 (1991).

[142] DACEY & LENNON, *supra* note 137, at 204.

[143] *Id.*

Left Hemisphere	Right Hemisphere
Verbal; Digital; Logical, analytical; Rational; Western oriented; Intellectual; Convergent; Inductive; Rational; Horizontal; Discrete; Concrete; Realistic; Directed; Differential; Sequential; Historical; Explicit; Objective; Successive	Nonverbal, visuospatial; Analog; Gestalt, synthetic; Intuitive; Eastern Oriented; Intuitive, sensuous, emotional; Divergent; Deductive; Metaphoric, intuitive; Vertical; Continuous; Abstract; Fantastic; Free; Existential; Multiple; Timeless; Implicit, tacit; Subjective; Simultaneous

See also SPRINGER & DEUTSCH, *supra* note 137, at 238-39 (discussing popularization of left-brain/right-brain hemisphere lateralization in 1970s).

[144] DACEY & LENNON, *supra* note 137, at 202-03.

[145] *Id.* at 202-05.

creativity as well. Artistic creativity, commonly perceived as an intuitive, holistic, subjective process springing forth from an author's mind, became associated with right-brain mode of thinking, involving cognitive processes that are internal, relational, and focused on the whole.[146] Technological innovation, on the other hand, commonly perceived as a much more linear, analytical process externally mandated by technical requirements, aligned closely with conceptual left-brain mode of thinking, involving cognitive processes that are logical, sequential, and focused on parts rather than the whole.[147] The left-brain/right-brain dichotomy also worked its way into popular culture, leading to a general social perception of creativity differences between left-brain, artist types versus right-brain, science-oriented people.[148]

The juxtaposition of left-brain versus right-brain is hardly the only dual-mode theory of cognition. Researchers have hypothesized about differentiation in cognitive function for some time. Sigmund Freud, for example, developed notions of primary versus secondary thought processes. The former involves the unconscious and fantasy, and lacks regular social and intellectual constraints;[149] the latter is more rational, logical, pragmatic, and based in reality.[150] Current cognitive psychologists, on the other hand, often distinguish between two types of reasoning, System 1 and System 2. System 1 reasoning is an

[146] DAVID MYERS, PSYCHOLOGY 92 (7th ed. 2004); *see also* J.P. Guilford, *Creativity Research: Past*, *Present and Future*, *in* FRONTIERS OF CREATIVITY RESEARCH 33, 41 (Scott G. Isaksen ed., 1987); Rhawn Joseph, *The Right Cerebral Hemisphere: Emotion*, *Music*, *Visual Spatial Skills*, *Body Image*, *Dreams*, *and Awareness*, 44 J. CLINICAL PSYCHOL. 630, 637-43 (1988).

[147] MYERS, *supra* note 146, at 92; ZINA O'LEARY, THE ESSENTIAL GUIDE TO DOING RESEARCH 2 (2004) (listing stereotypical attributes of researches and noting their correlation to attributes of left-brained individuals).

[148] *See*, *e.g.*, BETTY EDWARDS, DRAWING ON THE RIGHT SIDE OF THE BRAIN (rev. ed. 1989) (providing culturally popular example of left-brain/right-brain differentiation); IACCINO, *supra* note 140, at 218 (explaining that in 1970s and 1980s educators and general public became too fixated on concept of teaching to right side of brain); SPRINGER & DEUTSCH, *supra* note 137, at 239 (discussing such a perception); Michael Hill, *Beyond Technology; Engineering Can Be Automated; the future belongs to artsy folks*, BALT. SUN, July 2, 2006, at 1F (discussing popular book that drew differentiation between left and right-brain skills); Ann Markusen, Editorial, *San Jose Should Become an Incubator for the Arts*, SAN JOSE MERCURY NEWS, Sept. 11, 2008, at 10A ("Silicon Valley is burgeoning with left-brainers, the scientists, engineers and computer whiz kids leading us into the technological future. But San Jose's right brain needs nurturing.").

[149] DEAN KEITH SIMONTON, ORIGINS OF GENIUS: DARWINIAN PERSPECTIVES ON CREATIVITY 63 (1999).

[150] *Id.*

intuitive, experiential system that operates in a fast, automatic, and associative manner; it is often emotionally charged, governed by habit, and more difficult to control or modify.[151] System 2 reasoning is a deliberative, analytic reasoning system that is slower, serial, and requires more effort; it is more consciously controlled and deliberative than System 1.[152] Other psychological experts have used paired terms such as "lateral" versus "vertical" thinking, "critical intelligence" versus "creative intelligence," and "rational" versus "suprarational" to describe dual modes of cognitive function.[153]

These different models of reasoning and cognition share obvious and strong similarities. Critically, all map relatively clearly onto common lay understandings of artistic versus scientific creativity.

2. Romantic Authors and Less Romantic Inventors

A related but separate dichotomy concerns the perceived relationship between creators and their work. Most people identify a much closer relationship between authors and their work than between inventors and their inventions. This differentiation is likely produced by the differentiated perception of cognition discussed above, as well as by well-established romantic notions of authorship.

The romantic concept of an individual author whose work embodies the author's spirit arose from the work of Immanuel Kant, who gave rise to the concept of an "author-genius," who creates something entirely new and unprecedented.[154] This perception of authorship produces a strong, personal link between an author and his or her work. Based on such romantic notions, copyright law in certain countries, such as France and Germany, developed strong authors' moral rights, providing authors certain rights over a work's attribution and integrity, regardless of whether the author has transferred the physical work or copyright in it.[155] The traditional view is that American (and British) copyright law, which lack moral rights

[151] Daniel Kahneman, *A Perspective on Judgment and Choice*, 58 AM. PSYCHOLOGIST 697, 698-700 (2003).

[152] *Id.*

[153] Paul Torrance, *Hemisphericity and Creative Functioning*, 15 J. RES. & DEV. IN EDUC. 29, 29-30 (1982).

[154] See Immanuel Kant, The Critique of Judgment 188-89, (J.H. Bernard trans., 2000) (1798); Martha Woodmansee, *The Genius and the Copyright: Economic and Legal Conditions of the Emergence of the 'Author*,' 17 EIGHTEENTH-CENTURY STUD. 425, 428-30 (1984).

[155] Catherine Fisk, *Credit Where It's Due: The Law and Norms of Attribution*, 95 GEO. L.J. 49, 67 (2006) [hereinafter *Norms of Attribution*]; Kwall, *supra* note 64, at 19.

doctrines, are not as bound to romantic notions of authorship because their copyright doctrines arose prior to the rise of the romantic concept of authorship in the nineteenth century.[156] Despite the reality that the copyright clause and Copyright Act are formally based on a utilitarian theory of copyright protection and predate Kant's work,[157] commentators have noted that romantic views of authorship still have worked their way into American copyright law.[158] This result, in some ways, should hardly be surprising. Though the genesis of American copyright law predates romantic conceptions of authorship, much of copyright law developed as common law in the nineteenth and twentieth centuries, during the height of the romantic period.[159]

Further, American perspectives on moral rights actually do reveal romantic notions of authorship, when viewed from a perspective that compares American copyright and patent law. Although American copyright law generally does not recognize moral rights in authors, there are exceptions in certain circumstances, and more importantly, this limitation draws routine and heavy criticism.[160] Patent law similarly lacks moral rights for inventors, but such rights are rarely advocated.[161]

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[156] James D. A. Boyle, *The Search for an Author: Shakespeare and the Framers*, 37 AM. U. L. REV. 625, 633 (1988) (stating that "romantic conception of authorship" is "200 year-old stereotype" rather than "timeless truth about Art"); Peter Jaszi, *Towards a Theory of Copyright: The Metamorphoses of "Authorship*," 1991 DUKE L.J. 455, 496 (1991); Kwall, *supra* note 64, at 19-20.

[157] Fogerty v. Fantasy, Inc., 510 U.S. 517, 524 (1994); Feist Publ'ns, Inc. v. Rural Tel. Serv., 499 U.S. 340, 349-50 (1991); Kwall, *supra* note 64, at 20.

[158] JAMES BOYLE, SHAMANS, SOFTWARE, AND SPLEENS: LAW AND THE CONSTRUCTION OF THE INFORMATION SOCIETY 53-59 (1996); ROSEMARY COOMBE, THE CULTURAL LIFE OF INTELLECTUAL PROPERTIES 284 (1998); Jaszi, *supra* note 156, at 455, 496-500.

[159] BOYLE, *supra* note 158, at 53-59; *see also* Fisk, *Law and the Employee-Inventor*, *supra* note 12, at 1160-61 (discussing romantic view of inventor during this same period).

[160] The Visual Artists Rights Act, 17 U.S.C. § 106(a) (2006) (providing limited rights of attribution and integrity in work to authors); Amy Alder, *Against Moral Rights*, 97 CAL. L. REV. 263, 264-65 (2009) (noting "largely repetitive law review literature" in which "[s]cholars take it as gospel that moral rights are crucial . . . [and that] . . . we need a more robust moral rights doctrine," but critiquing this position); Edward Damich, *The Right of Personality: A Common-Law Basis for the Protection of the Moral Rights of Authors*, 23 GA. L. REV. 1, 35, 74 (1988); Fisk, *Norms of Attribution*, *supra* note 155, at 69; Kwall, *supra* note 64, at 22-26.

[161] Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1597-99 (2003) ("While there have been a few theories of patent law based in moral right, reward, or distributive justice, they are hard to take seriously as explanations for the actual scope of patent law.").

Current societal perceptions provide perhaps the starkest example of the difference between the artist-work and inventor-invention relationships. Most individuals can make many current associations between authors and their literary, musical, or artistic works, but almost no associations between modern inventors and their inventions.[162] It is not that authored works have necessarily shaped society to a greater extent over the past half-century than technological innovation (consider, for example, medical and computer advances). It is true that many people would associate invention, as opposed to artistic creativity, more with corporate accomplishment than occurs for artistic creativity. People think of Eli Lilly "inventing" Prozac and Apple "inventing" the iPod, but it sounds incongruous to refer to Random House "authoring" a book or Universal Music "authoring" an album in the same manner.

There are likely a number of explanations for this disparity, but it appears evident that one important difference is the extent to which society personalizes the relationship between an author and his work, but depersonalizes the relationship between an inventor and her invention. This, in turn, is likely due in part to the fact that right-brain creativity is associated with artistic expression and commonly perceived to be more relational and personal, while left-brain creativity is associated with scientists and commonly perceived to be more discrete.

B. Creativity Stereotypes in Intellectual Property Law

The stereotypes of inventive and artistic creativity described above can be applied to test the hypothesis that creativity stereotypes provide a better behavioral model than other current theories to explain certain components of intellectual property law. Four lines of evidence support this hypothesis: the strong correspondence between creativity stereotypes and legal doctrine, the text of joint creator opinions, comparative joint creator law, and temporal differences in the historic development of joint inventor versus joint author law.

[162] As an example, consider how many inventors from the past fifty years you (the reader) can name and link to particular inventions. Most people are hard-pressed to identify more than a handful. Asking yourself (or someone else) to name authors, artists, or songwriters of the past fifty years, on the other hand, easily produces an extensive list.

1. Left-Brain/Right-Brain Stereotypes in Joint Creator Law

The variation between joint inventor and joint author doctrine is remarkably consistent with the common stereotypes about differences between left-brain scientist versus right-brain author creativity, and between author-work versus inventor-invention relationships. Artistic creativity is commonly perceived as more personal and individual, and copyright law does not provide for joint authorship unless both parties intended to be joint authors and each contributed individually protectable originality. When joint authorship does exist, individual authors have a duty to account to each other for profits from exploiting the work. Joint creator law thus protects the individual creator's personal connection to the work — authors are not forced into a joint relationship unless each intends it.

Inventive creativity, on the other hand, is routinely considered to involve a more linear process based on an externally mandated need. Joint inventor law correspondingly provides that anyone who contributes a step in the process is entitled to joint inventorship, regardless of intent, and even if the contribution on its own would not be patentable. Because inventive creativity is viewed as more discrete, and inventors as less connected to their inventions, joint inventor law focuses on isolated contributions rather than the whole and it is more acceptable for inventors to be forced into joint relationships. Similarly, joint inventors, perceived as less related and more independent of their output, need not account to each other for profits.

The relationship between author versus inventor stereotypes and joint creator doctrine is supported by the decisions in which the doctrine developed. The Second Circuit in *Childress* explicitly struggled with whether joint authorship should require intent to be joint authors per se, or only intent to collaborate to produce a joint work, and discussed the ambiguity in the legislative history of the 1976 Copyright Act concerning this distinction.[163] The circuit court concluded, "it is hard to imagine activity that would constitute meaningful 'collaboration' unaccompanied by the requisite intent . . . [that the] contributions be merged into a unitary whole,"[164] and on this basis adopted the intent standard. This analysis, however, confuses intent to collaborate on a work with intent to be (legal) joint authors. The court essentially was unable to recognize the conceptual difference between a joint work and joint authorship.

[163] Childress v. Taylor, 945 F.2d 500, 505 (2d Cir. 1991).

[164] *Id.*

Patent's joint inventor law, however, makes clear that such concepts can easily be differentiated — joint inventor law, in fact, depends on it. Why could the Second Circuit not separate artists from their work, while patent law easily separates inventors from their invention? One explanation is that artistic endeavors are viewed so personally and holistically that conceptually separating authors and their work is less intuitive.

The court in *Ethicon* may have been equally blind in the opposite direction as *Childress*. The *Ethicon* court had no problem impersonally distinguishing the inventors from their invention, or with rendering the lead researcher Yoon's intent irrelevant. It was so obvious to the Federal Circuit that the collaborators could be segregated from the work product that the *Ethicon* court was not even aware of the bind that the *Childress* court could not see beyond.

The *Ethicon* court's decision to award Choi, who contributed to only two claims of the couple dozen patented, an equal interest in the entire patent is another example of treating inventors differently from authors. The *Childress* and *Marks* courts were very concerned with protecting primary authors from violation of their interest in copyright works; the *Ethicon* court had no such problems, despite the court's awareness that the Patent Act did not dictate such a result.[165]

Differing rules for accounting to joint owners and commencing infringement suits provide further evidence of the integrated view of authored works versus the segregated view of invention. As noted, American copyright law permits co-authors to independently exploit a work, but an author who does so must account to the other co-owners.[166] Joint inventor law, conversely, explicitly permits co-inventors to license their patent "without accounting to the other owners," a rule developed in early common law for what were referred to as equitable reasons.[167] Patent law also requires that a suit for infringement be joined by all co-owners; there is no equivalent requirement in copyright.[168] To be sure, there are particular reasons for this requirement in patent law, as the possibility of a patent being invalidated would strongly prejudice one's co-owners, but is less of a concern in copyright. Other commonly identified purposes for the

[165] *See supra* Part I.A-B.

[166] Gaiman v. McFarlane, 360 F.3d 644, 652 (7th Cir. 2004); 18 C.J.S. *Copyrights* § 24 (2008).

[167] 35 U.S.C. § 262 (2006); *see* Vose v. Singer, 86 Mass. (4 Allen) 226, 232 (1862).

[168] 17 U.S.C. § 501(b) (2006); Willingham v. Lawton, 555 F.2d 1340, 1344 (6th Cir. 1977); *see* Ethicon Inc. v. U.S. Surgical Corp., 135 F.3d 1456, 1468 (Fed. Cir. 1998).

patent rule, however, such as protecting infringers from multiple lawsuits and protecting licensees from suits by co-owners,[169] apply equally in copyright. The bottom line of the accounting and litigation differences is that joint inventors acquire extraordinary rights against each other — they can license the work without accounting to their co-owners and can preclude their co-owners from bringing lawsuits — rights that co-authors lack. These differences are further consistent with an impersonal view of the relationship between inventors and their invention versus a personal view of the relation between authors and their work.

In addition to the effects of left-brain/right-brain creativity stereotypes, differences in joint creator law also appear to display a bias towards a more romantic notion of authors than of inventors. The preference for identifying distinct individual authors of works versus more easily recognizing invention by committee provides a clear example.[170]

This is not to say that all joint author law depends solely on a romantic notion of a single author, only that it appears to do so to a greater extent than joint inventor law relies on a romantic notion of a single inventor. Romantic notions of individual inventors do certainly remain. Americans idolize the achievements of single, iconic inventors such Edison and the light bulb, Bell and the telephone, and Salk and the polio vaccine.[171] The common conception of the "Eureka" moment of invention, achieved by a single researcher, remains a classic paradigm.[172] That being said, each of the individuals and inventions

[169] *Willingham*, 555 F.2d at 1344.

[170] Kwall, *supra* note 64, at 44-45 ("The Romantic view of authorship seems to pervade the operation of copyright's joint authorship doctrine . . . ."); Sibley, *supra* note 89, at 342 ("[T]he cult of the romantic author (much like that of the hero-intentor) runs deep in the history of United States copyright law."). Romantic author concepts are less clear in other doctrines, such as that permitting one joint author to alter or modify a work without the permission of the other, or to use a work in a manner objectionable to the other. *See* Weinstein v. Univ. of Ill., 811 F.2d 1091, 1094-95 (7th Cir. 1987) (noting co-authors may make changes to work and publish revisions without consent of other co-authors). These provisions, however, concern joint author rights vis-à-vis each other, not the establishment of joint author rights in the first instance.

[171] *See also* Elisabeth Crawford, *Nobel: Always the Winners, Never the Losers*, 282 SCI. 1256, 1257 (1998); Sibley, *supra* note 89, at 342.

[172] Burk & Lemley, *supra* note 161, at 1583 ("The prototypical innovation contemplated by the patent law is made by an individual inventor working in his garage after hours."); Kevin Dunbar, *How Scientists Build Models: In Vivo Science as a Window on the Scientific Method*, *in* MODEL-BASED REASONING IN SCIENTIFIC DISCOVERY 85, 96 (Lorenzo Magnani & Paul Thagard eds., 1999); Sibley, *supra* note 89, at 330. The image of a person yelling "Eureka!" upon a significant insight is traced to

noted above is over a half-century old, and as discussed above, there is much less association between inventions and inventors in modern times. Society is now more aware, as technology has become recognizably more complex, that new inventions often involve the work of many contributors.[173] No individual is credited with inventing the computer, the cell phone, or the Internet. Joint inventor law, in comparison to joint author law, is more postmodern in this regard, recognizing that inventions do not result from the unitary creativity of a single inventor.[174]

The differences between joint author and joint inventor law thus map remarkably consistently onto common social stereotypes about right-brain artists versus left-brain inventors, as well as onto common romantic notions of authorship versus inventorship. This correspondence provides evidence that joint creator doctrine may have been driven, at least in part, by such sociocultural biases.

2. Textual Evidence of Stereotype-Driven Joint Creator Law

The language of judicial opinions also supports the hypothesis that judges view the creativity of authors and inventors differently. Though published opinions rarely reveal a judge's notion of the creative process, those that do tend to reveal distinct descriptions of artistic creativity versus inventive creativity.

The inventive process is routinely described in judicial opinions as a search by the inventor, a conception that almost necessarily entails a logical, goal-driven form of creativity.[175] The artistic process, on the other hand, is never described in these terms.[176] One court, for

Archimedes, who had been searching for a way to measure the volume of an irregular object (in particular, a crown), getting into a bath and realizing that the volume of water displaced by his body was equal to the amount of his body submerged. He was so excited about his discovery that he ran through the streets shouting "Eureka" (Greek for "I have found it"). SIMONTON, *supra* note 149, at 35.

[173] Fisk, *Law and the Employee-Inventor*, *supra* note 12, at 1141.

[174] *See* Dreyfuss, *supra* note 111, at 1215. There is, of course, an underlying empirical question concerning this conclusion. Are copyrighted works (or valuable copyrighted works) more commonly produced by single individuals, while patented inventions are more commonly produced by multiple inventors? This is a difficult question to answer because, as discussed below, the definitions of "author" and "inventor" are highly socialized and contextual. *See infra* Part III.

[175] *See, e.g.*, Warner-Lambert Co. v. Teva Pharms. USA, Inc., 418 F.3d 1326, 1330 (Fed. Cir. 2005) (describing invention as search). A search of the ALLFEDS database for "patent & search w/5 solution" identified fifty-four cases on February 5, 2010.

[176] A search of the ALLFEDS database for "copyright & search w/5 solution" identified eight cases on February 5, 2010, none of which referred to the creative process of an author in using the term "search."

example, took an archetypal left-brain view of inventive creativity, reasoning,

> I am not impressed with the . . . argument that the patent lacks invention because its results were or should have been expected. . . . The theory of unexpectedness as a sine qua non of invention cannot be extended too far. While some discoveries are stumbled upon by accident, most of them are made by persons seeking to attain the desired result. Since most inventors are optimistic, it might be said most inventions are expected.[177]

Artistic creativity would never be described as "expected."

Judicial opinions, in fact, rarely even try to describe the artistic creative process, presumably because it is considered so ineffable. When opinions do describe authorial creativity they default to traditional right-brain artist conceptions, for instance, referring to "the mysterious ebb and flow of an artist's creative powers"[178] or an "intrinsically individualistic" process.[179]

Broader evidence across judicial opinions also points to differences in how judges treat artistic versus inventive creativity. Judicial opinions, for example, are about twenty times more likely to use the term "creative" to describe artistic copyright endeavors than to describe inventive patent endeavors.[180] This difference is particularly

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[177] Pa. Research Corp. v. Lescarboura Spawn Co., 29 F. Supp. 340, 343 (D. Pa. 1939). This is not to claim that all courts take such a view of invention. The Supreme Court recently enumerated a conception of invention involving both analytical and intuitive creative processes: "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." KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 427 (2007).

[178] Gary Price Studios, Inc. v. Randolph Rose Collection, Inc., No. 03CIV969 (CSH), 2006 WL 1319543, at *7 (S.D.N.Y. 2006).

[179] Am. Dental Ass'n v. Delta Dental Plans Ass'n, No. 92C5909, 1996 WL 224494, at *16 (N.D. Ill. 1996).

[180] The search "copyright & creativ! /5 (artist writer playwright composer author) % 'creative artists agency' % 'authors and inventors' " returned 329 documents in the Westlaw ALLFEDS database, while the search "patent & creativ! /5 (inventor scientist) % 'creative artists agency' % 'authors and inventors' " returned 42 documents, each as of February 5, 2010 (excluding "creative artists agency" as name of party in commonly cited opinion; excluding "authors and inventors" to remove common references to Intellectual Property Clause). This approximately eight-fold difference in total documents converts to an approximately twenty-fold difference on a citation per decision basis because there are approximately 2.5 times as many reported patent cases as copyright cases. For example, as of February 5, 2010, there are 7,656 decisions in the ALLFEDS database since Dec. 31, 2007 that mention the term

striking given that the creativity threshold for patent protection (i.e., nonobviousness) is a critical issue in many patent cases, but rarely at issue in copyright actions due to the minimal threshold required (i.e., originality). In sum, courts use significantly different language to discuss the creativity and creative processes of authors versus inventors, a difference that once again aligns with traditional stereotypes of left-brain scientists versus right-brain authors.

3. Comparative Evidence of Stereotype-Driven Joint Creator Law

Returning to comparative study of joint creator doctrine provides further evidence that creativity stereotypes have influenced American joint creator law. Based on the substantial overall global harmonization in intellectual property law, as discussed above, differences in patent versus copyright subject matter and doctrine cannot explain the variation in different countries' joint creation laws. Differences in cultural conceptions, however, could explain this variation, as different cultures have different conceptions of creativity and its sources. This explanation would be easy to overstate — undoubtedly variations in intellectual property law derive from a variety of sources, many unrelated to cultural conceptions of creativity.

It is worth noting, however, that other cultures, particularly Eastern cultures, often view creativity as integrating collective inputs from many individuals and sources across time to produce a new work.[181] Compared to the traditional American perspective of Edison as the inventor of the light bulb, Eastern cultures would be more likely to recognize the contributions both of many inventors before Edison's advance and of the many individuals working in Edison's research lab.[182] Eastern cultures also often emphasize a more relational,

"patent," but only 3,210 documents that mention the term "copyright." This disparity is not only a modern phenomenon. Searches spanning the decade of the 1980s find 8,712 patent cases and 3,011 copyright cases; searches spanning the 1950s find 5,165 patent cases and 751 copyright cases.

[181] WILLIAM P. ALFORD, TO STEAL A BOOK IS AN ELEGANT OFFENSE: INTELLECTUAL PROPERTY LAW IN CHINESE CIVILIZATION 19-20 (1997); Carla Hesse, *The Rise of Intellectual Property, 700 B.C.-A.D. 2000: An Idea in the Balance*, 131 DÆDALUS 26, 27 (2002). *But see* WEI SHI, INTELLECTUAL PROPERTY IN THE GLOBAL TRADING SYSTEM: EU-CHINA PERSPECTIVE 106-07 (2008) (contending role of Confucian philosophy is overstated and inaccurate).

[182] *See* Gregory Mandel, *Thomas Edison's Patent Application for the Incandescent Light Bulb*, *in* 2 MILESTONE DOCUMENTS IN AMERICAN HISTORY 978, 979-80 (Paul Finkelman ed., 2008) (discussing contributions by others to invention of light bulb).

intuitive style of cognition.[183] American society, on the other hand, romanticizes individual authors and inventors to a greater extent, and Western cultures often focus on more logical, analytical thought processes.[184] Studies of cognitive perception reveal that individuals from Western cultures tend to focus on discrete objects and categorize objects in order to group and organize them.[185] Individuals from Eastern cultures, on the other hand, focus more holistically on the relationships and similarities among objects.[186]

Confucius famously stated, "I transmit rather than create," referring to the contributions of those before him.[187] This greater recognition of the contributions of many to a new work could help explain the relative ease with which many other countries, particularly many Asian countries, grant joint authorship rights as compared with the United States. Similarly, some of the Asian countries permit individuals to become joint inventors more easily than in the United States, and none makes it more difficult.[188] This is not definitive proof, but adds to evidence that paints a picture of culturally contingent joint creator law.

4. Timing Evidence of Stereotype-Driven Joint Creator Law

In addition to the correspondence between doctrine and stereotype, the textual evidence of stereotype, and the comparative analysis, it also appears that variation in American joint creator law correlates with different conceptions of creativity that were in vogue at the times that joint author versus joint inventor doctrine developed. The inception of less romantic joint inventor law in the early nineteenth century, for example, predated the rise of romanticism. The development of many details of current joint inventor doctrine in the latter part of the twentieth century similarly dovetails with the decline of romanticism

[183] IACCINO, *supra* note 140, at 43; Kun-pyo Lee, *Culture, Interface Design, and Design Methods for Mobile Devices*, *in* MOBILE TV: CUSTOMIZING CONTENT AND EXPERIENCE 37, 40-42, 51-59 (Aaron Marcus et al. eds., 2010).

[184] IACCINO, *supra* note 140, at 42. Studies within the United States have found that certain African-American and Native-American groups are more right-brain style oriented than whites. *Id.* at 42.

[185] Richard Nisbett & Yuri Miyamoto, *The Influence of Culture: Holistic versus Analytic Perception*, 9 TRENDS IN COGNITIVE SCI. 467, 467 (2005) (reviewing number of studies examining perceptions of American, Asian, Asian American, and European American individuals).

[186] *Id.*

[187] Hesse, *supra* note 181, at 27.

[188] *See supra* Part I.D.

during this period and the rise of a postmodern view of creative achievement that acknowledges inputs from many sources.[189]

The greater romanticism of joint authorship law also fits this temporal analysis. Tracing joint authorship doctrine to the original English case, *Levy v. Rutley*, places it squarely within the height of the romantic period. One year after *Levy*, for example, the United States Supreme Court decided *Burrow-Giles Lithographic Company v. Sarony*,[190] a seminal copyright decision that has been highlighted as displaying evident romantic notions of authorship.[191]

Not all the evidence necessarily supports such a precise story. Judge Hand's 1915 district court decision first establishing joint author doctrine in the United States, and particularly his Second Circuit opinion in *Marks* further elaborating it three decades later, both develop more romantic joint author law at a time when the romantic view of authorship was on the wane, being replaced by a more economic perspective that favored the rights of publishers and purchasers.[192] Similarly, the recent copyright cases establishing the independent copyrightability and strong intent requirements produce a "romantic result" in a postmodern period. The evolution of joint inventor law also diverges from the simple temporal account. The Supreme Court cases on joint inventorship in the mid-nineteenth century were decided solidly within the romantic period, yet applied pre-romantic joint inventor law. Professor Catherine Fisk has identified a romantic notion of individual inventors as a cause of the development of other patent doctrine during this era.[193]

That being said, in both Judge Hand cases, the court (applying the more romantic doctrine) reached a non-romantic result, holding that the plaintiff in each case was a joint author of the disputed work.[194] Similarly, both Supreme Court joint inventor cases from the 1800s reached a "romantic" result, holding that there was an individual, not joint, inventor in each scenario. Concerning the recent joint author cases, commentators such as Professor Peter Jaszi have pointed to a

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189 *Supra* Part I.A.

190 Burrow-Giles Lithographic Co. v. Sarony, 111 U.S. 53, 53 (1884).

191 Jaszi, *supra* note 156, at 482.

192 *Id.* at 477-78.

193 Fisk, *Law and the Employee-Inventor*, *supra* note 12, at 1135-36. Fisk's analysis is particularly germane as it involves the closely related area of the rights of employees versus employers in inventions developed in the scope of employment. *Id.* at 1132-33.

194 *See* Marks Music v. Vogel Music, 140 F.2d 266, 267 (2d. Cir. 1944); Maurel v. Smith, 220 F. 195, 199 (S.D.N.Y. 1915).

revival of romantic notions of authorship in other areas of copyright law during this period.[195]

There may be something to the vagaries of temporal development significantly affecting the substance of joint inventor and joint author law. It would not be surprising that doctrine developed largely in common law is imbued with the dogma of the day. One must be wary, however, of tracing the differences in joint creator doctrine to such a simple historical account. Legal developments can rarely be explained in such an orderly fashion. Another explanation for the differences, for example, could consider that corporate research and development departments do not necessarily favor the concept of an individual inventor, while corporate arts producers and distributors take advantage of identifiable authorship to promote various musical, literary, and artistic works.

Whether substantially explanatory or not, the historic account does highlight the stochastic nature of the biases that appear to drive the disparities between joint author and joint inventor law. Regardless of the full causal chain of events, the differences in joint author and joint inventor law appear to derive, at least in part, from stereotypes about right-brain artists versus left-brain inventors.

Sherlock Holmes was fond of stating, "[W]hen you have eliminated [all other possibilities], whatever remains, *however improbable*, must be the truth."[196] Proof by inference, however, is rarely determinative. One cannot eliminate all other causal possibilities because it is always conceivable that some as yet unidentified account better explains reality than the analysis offered here. It is impossible to know what was in the mind of Justice Story or Judge Hand a century or two ago, or in the minds of the judges who helped shape the doctrines subsequently. Even the more recent legislative history is generally sparse, aside from expressing intent to codify existing intellectual property common law. Nevertheless, the creativity stereotype model of intellectual property law offered here not only matches the real world evidence in several significant manners, but also for the first time presents a single consistent model to explain the differences across joint creator law.

The conclusion that stereotypes of creativity are a cause of the variation in joint creator law does not require judges and legislators to have some sophisticated, intricate understanding of analytical versus intuitive cognitive function in mind when making law. Basic lay

[195] Jaszi, *supra* note 156, at 492.

[196] ARTHUR CONAN DOYLE, THE SIGN OF FOUR 93 (Spencer Blackett 1890).

prejudices about the differences between the creative processes of artists versus inventors are sufficient to produce this result.

Stereotypes, however, are often both incorrect and dangerous, and such is the case here. Current research indicates that the common author and inventor stereotypes do not accurately portray actual creative processes. As a result, the dichotomy between modes of creativity for authors versus inventors — in both perception and intellectual property law — is substantially exaggerated. Problematically, intellectual property law based on such inaccurate stereotypes may produce undesirable consequences, including inequitable and inefficient law. Examining current research on creativity and the creative process provides valuable insight for how to improve copyright and patent doctrine in these regards.

C. The Reality of Inventive and Artistic Creativity

There are several errors in the impoverished caricatures of left-brain scientists and right-brain artists. The first is that innovative artists and scientists do not use only half their brain; rather, inspired artistic and technological achievement usually comes from a harmonious mix of intuitive and analytic creativity.[197] A second error is that artistic and inventive creativity are not as dissimilar as the popular conception.[198] As one of the leading psychologists who studies creativity writes, "[T]here is one basic form of creativity, one basic quality of products that observers are responding to when they call something 'creative,' whether they are working in science or the arts."[199] A third error is that the historically perceived differentiation in hemispheric function is greatly overstated.[200] The commonly accepted left-brain/right-brain dichotomy is both oversimplified and misleading.

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[197] DACEY & LENNON, *supra* note 137, at 216-17; IACCINO, *supra* note 140, at 10; *see* Torrance, *supra* note 153, at 29 (discussing "common failure to regard creative functioning as a process rather than a single, quick instance of insight or mental leap"). Cognitive psychologists who study decision-making believe that good decision-making is most likely to emerge from the two modes of thinking working in concert. *See generally* ANTONIO DAMASIO, DESCARTES' ERROR: EMOTION, REASON, AND THE HUMAN BRAIN (1994) (discussing the two modes of thinking working together).

[198] *See, e.g.*, Robert J. Sternberg, *What Is the Common Thread of Creativity? Its Dialectical Relation to Intelligence and Wisdom*, 56 AM. PSYCHOLOGIST 360, 361 (2001) (discussing commonality of creativity among scientists, painters, and writers).

[199] THERESA AMABILE, CREATIVITY IN CONTEXT 34 (1996); *see also* SIMONTON, *supra* note 149, at 5-7 (discussing single type of creativity shared by artists and scientists); Vernon, *supra* note 140, at 440 (commenting that idea of hemispherical differentiation has been absorbed into common culture and is over-used and over-simplified).

[200] DACEY & LENNON, *supra* note 137, at 204; SPRINGER & DEUTSCH, *supra* note 137,

Despite the objective of intellectual property law to facilitate creativity,[201] understanding creativity is hardly something within the competent domain of law and legal analysis. Judges and legislators developing intellectual property law have paid remarkably little attention to what experts know about how to actually promote the creative process. As a consequence of this inattention, it is not surprising that an artist evaluating copyright law explained, "I see much in the nature of the laws sadly lacking in any real understanding of the creative process."[202]

Various disciplines, most prominently psychology and neurobiology, do study cognition and the creative process. Other disciplines, including sociology and anthropology, study certain aspects of creativity and collaboration, topics highly pertinent to joint creator law. Legal analysis has largely ignored these issues and this

at 238-39.

[201] The Supreme Court regularly identifies creativity as a core goal of intellectual property rights. *See, e.g.*, Eldred v. Ashcroft, 537 U.S. 186, 223 (2003) ("the grant of exclusive rights [in the Intellectual Property clause] is intended to encourage the creativity of 'Authors and Inventors.' "); Sony Corp. of Am. v. Universal City Studios, Inc., 464 U.S. 417, 429 (1984) (granting of patents and copyrights are "intended to motivate the creative activity of authors and inventors"); Goldstein v. California, 412 U.S. 546, 555 (1973) (noting that intellectual property rights are meant "to encourage people to devote themselves to intellectual and artistic creation"). Many commentators note the same goal. *See*, *e.g.*, Julie Cohen, *Creativity and Culture in Copyright Theory*, 40 UC DAVIS L. REV. 1151 (2007) ("Creativity is universally agreed to be a good that copyright law should seek to promote."); Fromer, *supra* note 7 (manuscript at 3) (indicating that one goal of patent and copyright law is to incentivize production of creative works); Roberta Kwall, *Inspiration and Innovation: The Intrinsic Dimension of the Artistic Soul*, 81 NOTRE DAME L. REV. 1945, 1946 (2006) (arguing that law should be designed to motivate creativity); Michael Madison, *A Pattern-Oriented Approach to Fair Use*, 45 WM. & MARY L. REV. 1525, 1533 (2004) ("novelty and creativity [are] the very sorts of end results that copyright policy, in a central sense, is designed to achieve").

This is not to claim that incentivizing creativity should be the only goal of joint creator law, or that such incentives are the only incentives necessary for the production joint works. Individuals create for myriad reasons. *See*, *e.g.*, Kwall, *supra*, at 1947 (noting that motivation for creativity can include "the desire for challenge, personal satisfaction, or the creation of works with a particular meaning or significance"); Rebecca Tushnet, *Copy This Essay: How Fair Use Doctrine Harms Free Speech and How Copying Serves It*, 114 YALE L.J. 535, 541 (2004) (explaining that incentives for authorship include promoting one's ideas, career advancement, fame, and personal accomplishment); *see also* Raymond Shih Ray Ku et al., *Does Copyright Law Promote Creativity? An Empirical Analysis of Copyright's Bounty*, 62 VAND. L. REV. 1669, 1708 (2009) (reporting empirical evidence showing weak relationship between stronger copyright laws and increases in creative works).

[202] J.S.G. Boggs, *Who Owns This?*, 68 CHI.-KENT L. REV. 889, 889 (1993).

research.[203] A multidisciplinary examination of these studies provides valuable insight into how the legal system can better promote creativity. Such study reveals a much closer correspondence between artistic and scientific creativity in definition, process, and analysis than is recognized in law.

1. A Neurobiological Perspective on Creativity

Neurobiologists now understand that the historic differentiation between left-brain and right-brain creativity was grossly exaggerated. The distinction between the creative function of the two hemispheres of the brain has been criticized as "dichotomania," "inaccurate and misleading," and "more the result of imaginative guesses than of hard research."[204] Differentiating left-brain and right-brain creativity is misleading on two levels. The first is that the two hemispheres do not operate distinctly, but rather together: "The brain always works as a unit; therefore, to imply that in the ordinary person [i.e., not brain-injured], the right hemisphere can somehow be separated from the left is inaccurate."[205] The second misperception is that the functions of the two hemispheres overlap to a much greater extent than the dichotomous speculation recognizes.[206] Different parts of the brain do not distinctly produce different types of creativity. Rather, creativity results from the "magic synthesis" of both hemispheres.[207]

Further, an individual's "handedness" (i.e., whether one is left- or right-handed) has not been demonstrated to be related to increased creative activity on the opposite side of the brain.[208] The perception, for instance, that left-handed people are right-brain dominant has turned out to be incorrect. Even recognized differences between hemispheric function do not present absolute rules. For some left-handed people, and a small percentage of right-handed people,

[203] Cohen, *supra* note 201, at 1152; Dreyfuss, *supra* note 111, at 1163-64. Cohen's and Dreyfuss' works provide two exceptions to this statement, as does Madison, *supra* note 201, at 1525 (applying interdisciplinary scholarship to copyright fair use issues), and most recently Fromer, *supra* note 7 (manuscript at 2-3). Hopefully these works, and the instant article, present the early stages of a trend towards recognizing the import of such studies to intellectual property law.

[204] DACEY & LENNON, *supra* note 137, at 203-04.

[205] RESTAK, *supra* note 141, at 38.

[206] DACEY & LENNON, *supra* note 137, at 203-04; IACCINO, *supra* note 140, at 11.

[207] DACEY & LENNON, *supra* note 137, at 206 (citing K. Hoppe & N. Kyle, *Dual Brain, Creativity, and Health*, 3 CREATIVITY RES. J. 150 (1990)).

[208] *Id.* at 207-08.

language is more of a right-brain function than left-brain.[209] More complexly, left-handers on average are less able to handle certain types of tasks (such as determining the relationship between objects and recognizing patterns) that are believed to be more right-brain oriented tasks, but are no less competent in language skills, a left-brain oriented task.[210]

While much remains to be learned about neurobiological creative function, it is now clear that the brain operates as a single integrated unit, and that various components of creative activity take place in various parts of the brain, which can differ from person to person. It is true that people engage in different cognitive modes of thinking in some sense, one more intuitive and relational, the other more analytic and deliberative. These modes, however, function interrelatedly, and both are necessary for creative breakthroughs, whether in the arts or sciences.

2. A Psychological Perspective on Creativity

Psychologists posit that creativity requires at least two, and possibly three, elements. The first two elements are novelty and appropriateness.[211] Novelty for psychologists (also referred to as "originality"), is remarkably akin to the novelty requirement in patent law and the originality requirement of copyright law.[212] Reproducing past work or repeating existing knowledge is not novel, and therefore not creative.[213]

[209] *Id.*; IACCINO, *supra* note 140, at 7-11.

[210] DACEY & LENNON, *supra* note 137, at 208-09. Intriguingly, left-handed people are slightly overrepresented among the most creative people. *Id.*

[211] Richard E. Mayer, *Fifty Years of Creativity Research*, *in* HANDBOOK OF CREATIVITY 449 (Robert J. Standberg ed., 1999) (noting that "the majority [of chapters in this book] endorse the idea that creativity involves the creation of an *original and useful* product"); Sternberg, *supra* note 198, at 360 (citing numerous sources). In addition to this conceptual account, creativity can also be defined by consensus: "A product or response is creative to the extent that appropriate observers independently agree it is creative. Appropriate observers are those familiar with the domain in which the product was created or the response articulated." AMABILE, *supra* note 199, at 33. Note how closely the consensual definition tracks the nonobviousness requirement in patent law — based on whether an invention would have been obvious to "those familiar with the domain" in which the invention was achieved.

[212] SIMONTON, *supra* note 149, at 5-6; R. Keith Sawyer, *Creativity*, *Innovation*, *and Obviousness*, 12 LEWIS & CLARK L. REV. 461, 462 (2008).

[213] SIMONTON, *supra* note 149, at 5-6. Novelty, for creativity purposes, is defined within a particular sociocultural group. Thus, Galileo's "discovery" of sunspots is considered novel (to his civilization) even though the Chinese had identified sunspots over a thousand years earlier. *Id.*

Appropriateness, also referred to as "adaptivity," requires that an idea be recognized as socially useful or valuable in some way to some community.[214] How appropriateness is achieved can vary between science and the arts. For a technological invention, appropriateness will often require functionality; for artistic expression, it may require the ability to keep the audience's attention or cause a powerful emotional effect.[215]

Some psychologists add a third element to the specification of creativity, requiring that a creative accomplishment be heuristic rather than algorithmic.[216] Algorithmic tasks are projects where the path to a solution or goal is clear and straightforward.[217] Heuristic tasks, in contrast, are ones that lack a clear or readily identifiable path to a solution.[218] Although not central to the thesis of this Article, this element has significant implications for the nonobviousness requirement in patent law.[219]

Psychologists and neurobiologists have found that the types of function involved in identifying something that is original and appropriate requires multiple cognitive processes to operate together. Originality requires divergent thinking, often a more intuitive function, while appropriateness requires convergent thinking, a more analytic function.[220]

The psychological delineation of creativity also makes its sociocultural dependence clear. Only society can judge whether something novel is appropriate.[221] As a result, creativity depends on and results from a constantly evolving and blended soup of social, cultural, and psychological factors.[222] Consequently, creativity is

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[214] Gregory Feist, *A Meta-Analysis of Personality in Scientific and Artistic Creativity*, 2 PERSONALITY & SOC. PSYCH. REV. 290, 290-91 (1998); Sawyer, *supra* note 212, at 462.

[215] SIMONTON, *supra* note 149, at 6; Sawyer, *supra* note 212, at 462.

[216] AMABILE, *supra* note 199, at 35.

[217] *Id.*

[218] *Id.*

[219] A heuristic versus algometric definition indicates that "the manner in which an invention is achieved" (contrary to the dictate of section 103(a)) does implicate its creativity. Rote trial-and-error work would not be considered creative. That being said, as discussed below, the prevalence of "rote" trial-and-error work is likely highly overstated.

[220] DACEY & LENNON, *supra* note 137, at 204-05, 214.

[221] SIMONTON, *supra* note 149, at 6.

[222] AMABILE, *supra* note 199, at 3, 124-27; DACEY & LENNON, *supra* note 137, at 15; Cohen, *supra* note 201, at 1152; 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, 136 (Lorenzo Magnani et al. eds., 1999).

necessarily culturally and historically contingent. The complex social and cultural environmental sources of creativity highlight that constructing appropriate joint inventor and author law may be critical to promoting creativity.

3. The Inventive Process

As the above discussion makes evident, the neurobiological and psychological understanding of creativity largely do not depend on whether an accomplishment is technological or artistic. This lack of distinction is supported by studies of the actual creative process in both science and the arts, which this and the next section discuss in turn. These results raise questions concerning the dissimilarity of various aspects of copyright and patent law, including particularly joint inventor and joint author law.

Despite the rational and ordered left-brain stereotype, in reality the inventive process is often intuitive and dynamic. Inventors routinely do not know what they are going to achieve or how they are going to achieve it. They often produce inventions that were not the goal when they began. The microwave oven, for example, was invented when a researcher realized that radiating vacuum tubes he was working with melted a candy bar in his pocket.[223] Post-it notes were invented by someone trying to formulate a strong, not weak, adhesive.[224] History is replete with spectacular inventions that were identified only as a by-product of other work. Examples include laughing gas anesthesia, dynamite, the phonograph, vaccination, X-rays, penicillin, Teflon, and Velcro.[225] Unpredictability is such an important part of innovation that there is a new peer-reviewed publication titled the *Journal of Serendipitous and Unexpected Results*.[226] Recognizing the unplanned, but not completely uncontrolled, path of invention, Louis Pasteur famously stated, "[C]hance favors only the prepared mind."[227]

Technological innovation often does not result from a straightforward linear process. There is rarely a singular "Eureka!"

[223] STEPHEN VAN DULKEN & ANDREW PHILLIPS, INVENTING THE 20TH CENTURY: 100 INVENTIONS THAT SHAPED THE WORLD 116-17 (2002).

[224] *Id.* at 180-81.

[225] SIMONTON, *supra* note 149, at 35-36; Thagard & Croft, *supra* note 222, at 126.

[226] JOURNAL OF SERENDIPITOUS & UNEXPECTED RESULTS, http://www.jsur.org/.

[227] H. PETER ALESSO & CRAIG F. SMITH, CONNECTIONS: PATTERNS OF DISCOVERY 6 (2007). The following discussion focuses on technological innovation and interweaves scientific discovery. Research has shown that the cognitive processes involved in technological and scientific creativity are similar. *See generally* Thagard & Croft, *supra* note 222, at 134-37 (identifying similarity between both types of cognition).

moment.[228] Rather, innovation more regularly emerges from the combination of many different ideas, over long periods of time, with the meaning of each idea often not clear when it is first proposed, nor the same from the beginning to end of the innovative process.[229] Inventors do not all-seeingly identify what they want to achieve, and then set forth on a direct, step-by-step path to achieve it. Instead, innovation involves a constantly changing course that requires a combination of generating many ideas, slowly refining selected ones, often shifting plans, and moments of intuition.[230] Henri Poincare explained, "[I]t is by logic we prove, it is by intuition we invent."[231] Similarly, scientific philosopher Karl Popper argued, "there is no such thing as a logical method of having new ideas, or a logical reconstruction of this process. . . . [E]very discovery contains 'an irrational element', or a 'creative intuition'."[232] Innovation usually requires a substantial dose of intuitive creativity.

The above discussion of the innovation process focuses on problem-solving — how to solve an identified problem. Psychologists recognize another aspect of creativity that is common in innovation, that of problem-finding — identifying a new problem that no one has recognized before.[233] This type of innovation involves more commonly perceived abstract thought, and studies indicate that experts and lay persons routinely view problem-finding as particularly creative innovation.[234]

Scientific creativity is viewed as similar to artistic creativity by both psychologists who study creativity and by scientists themselves.[235]

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[228] Sawyer, *supra* note 212, at 479; Torrance, *supra* note 153, at 29. Just recently, the Supreme Court in *KSR v. Teleflex* still seemed wedded to this unitary conception of innovation. *See* KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 420-21 (2007); *see* Sawyer, *supra* note 212, at 479 (critiquing Court for this disposition); Sibley, *supra* note 89, at 335 (same).

[229] Sawyer, *supra* note 212, at 479; Sibley, *supra* note 89, at 338-39; Twila Z. Tardif & Robert J. Sternberg, *What Do We Know About Creativity?*, *in* THE NATURE OF CREATIVITY 429, 430 (Robert J. Sternberg ed., 1988).

[230] SIMONTON, *supra* note 149, at 70-71; Sawyer, *supra* note 212, at 479; Cohen, *supra* note 201, at 1189.

[231] ROGER S. FRANTZ, TWO MINDS: INTUITION AND ANALYSIS IN THE HISTORY OF ECONOMIC THOUGHT 6 (2005).

[232] KARL POPPER, THE LOGIC OF SCIENTIFIC DISCOVERY 8 (Routledge 2002).

[233] Sawyer, *supra* note 212, at 473-74.

[234] *Id.* (stating that problem-finding often produces "most radical breakthroughs").

[235] Although most psychologists who study creativity would agree with this statement, this understanding is not universal. Nobel laureate Herbert Simon contends that scientific discovery follows more rigid, logical principles, and in an effort to make his case has designed computers to "discover" various scientific formulas, such as

Nobel laureate Max Planck believed that creative scientists "must have a vivid intuitive imagination, for new ideas are not generated by deduction, but by an artistically creative imagination."[236] Albert Einstein echoed this sentiment, noting that "imagination is more important than knowledge" for new scientific discovery.[237]

A study of the mental processes of sixty-four eminent scientists found that they often describe their inventive thought processes in manners usually attributed to artistic creativity.[238] Representative descriptions of moments of discovery included, "I often know intuitively what the answer is, and then I have to work it out to show it," and, "You feel it in your guts."[239]

Other research has examined scientific and technological innovation as it is occurring. One researcher studied scientific mental processes by observing scientists at work in molecular biology and immunology laboratories in the United States and other countries.[240] These observations revealed that the scientific process, at least in these laboratories, did not follow a straightforward, linear, step-by-step progression. Fully half of the results obtained in the labs during the periods observed (ranging from three months to one year) were unexpected according to the scientists themselves.[241] The scientists devoted substantial time to understanding the unexpected outcomes, and determining whether they resulted from flaws in the experiment's methodology or indicated a need to revise theory.[242] Rather than being unusual, unexpected outcomes were the norm of this research. As Isaac Asimov remarked, "The most exciting phrase to hear in science, the one that heralds new discoveries, is not 'Eureka' (I found it) but rather 'hmm . . . that's funny.' "[243]

This analysis should not be read to indicate that logic and reason do not play a critical part in invention — they do. Creativity researchers

Planck's formula for blackbody radiation or Kepler's third law of planetary motion. This work, as a model of actual scientific creativity, has been criticized for oversimplifying the problems, hindsight in defining the problems, and hindsight in ordering the operations. SIMONTON, *supra* note 149, at 50-55.

[236] *Id.* at 29.

[237] *Id.*

[238] *See id.* at 32 (discussing manner in which scientists described inventive process).

[239] *Id.*

[240] Dunbar, *supra* note 172, at 85-86.

[241] *Id.* at 90.

[242] *Id.* at 91.

[243] CRAIG C. LUNDBERG & CHERI A. YOUNG, FOUNDATIONS FOR INQUIRY: CHOICES AND TRADE-OFFS IN THE ORGANIZATIONAL SCIENCES 378 (2005).

recognize the important role of analytical creativity to scientific and technological endeavors just as well as the intuitive.[244] Think back to Pasteur's statement: the prepared mind is a model of analytical cognition. Similarly, the researcher who found that half the results in molecular biology and immunology laboratories were unexpected also found that half were logically predicted. This researcher further reported on observing the structured, rational way in which the scientists often reason by analogy and the meticulous way they would sometimes go about trying to search for potential methodological flaws in their experiments.[245] The bottom line is that technological invention is not an either/or creative process but a both/and—it springs from a mixture of multiple styles of creative thought.

4. The Artistic Process

The common cultural stereotype of artistic creativity is just as inaccurately biased as that of technological creativity. Artistic creation often involves logical cognition and externally focused objectives. This is particularly true if we focus on joint endeavors. The most common and classic areas of joint works involve plays, songs, and movies.[246] Someone who contributes a scene to a play (as in *Levy v. Rutley* or *Maurel v. Smith*) must assure that the scene rationally fits the characters and storyline. Lyrics must match melody, and vice-versa, for a successful song. Movies require practical integration along a variety of fronts.

As with inventors, artists' own descriptions of their creative processes demonstrate the inaccuracies of the common stereotype. Edgar Allan Poe described authoring *The Raven*, one of the most famous poems of all time, as follows: "It was my design to render it manifest that no one point in its composition is referable either to accident or intuition — that the work proceeded, step by step, to its completion with the precision and rigid consequence of a mathematical problem."[247] Poe goes on to describe how logic dictated his every decision in *The Raven*, from the optimal number of words to the individual words and imagery used.[248] While it seems hard to believe that Poe was not exaggerating at least a little, it is also evident

[244] AMABILE, *supra* note 199, at 87-90; SIMONTON, *supra* note 149, at 62.

[245] Dunbar, *supra* note 172, at 87-92.

[246] Nearly every joint author case cited in this article involves one of these types of work.

[247] SIMONTON, *supra* note 149, at 39.

[248] *Id.*

that logic and reason play a significant role in artistic creativity. The importance of analytical creativity is unambiguous in many classical works of art, such as Michelangelo's *David*, Leonardo da Vinci's *Mona Lisa*, and William Shakespeare's plays. It is evident in modern, less Realist, art as well, such as Pablo Picasso's paintings, J.K. Rowling's Harry Potter books, Annie Leibovitz's photographs, and Steven Spielberg's films, all of which display numerous careful, analytic components. Consider Picasso's careful choice of color and form for certain visual impact, Rowling's intricate plots, Leibovitz's precise design and arrangements, and Spielberg's internally-consistent, complex science fiction worlds. One creativity expert used Picasso's careful sketches that preceded his renowned Guernica painting to demonstrate that artistic and scientific creativity are not so different.[249]

As with inventors, researchers have found that artistic creativity often results from the generation of many ideas, and then the selection of those that satisfy desired criteria (here, such as aesthetic goals).[250] Artists often do not know what they are trying to achieve, nor how they are going to achieve it.[251] Serendipity, likewise, can play a significant role in artistic expression, just as it does in technological innovation.[252]

Artistic creativity, like technological creativity, depends significantly on more holistic, relational creativity as well logical cognition. Trying to delve into the mental processes that produce artistic expression reveal this reliance. As Professor Julie Cohen explains, "When asked to discuss the source of their inspiration, individual artists describe a process that is intrinsically ineffable."[253] A study of the process of composing music explains that "very often [the composer] is unaware of his exact process of thought till he is through with them."[254] Consider how similar these descriptions sound to the cognitive processes identified in the study of eminent scientists discussed above, one of whom explained, "I just seem to vegetate; something is going on, I don't know what it is."[255]

[249] Dean Keith Simonton, *The Creative Process in Picasso's Guernica Sketches: Monotonic Improvements Versus Nonmonotonic Variants*, 19 CREATIVITY RES. J. 329, 330 (2007).

[250] SIMONTON, *supra* note 149, at 21, 26.

[251] Cohen, *supra* note 201, at 1178.

[252] SIMONTON, *supra* note 149, at 36.

[253] Cohen, *supra* note 201, at 1151.

[254] Roger Sessions, *The Composer and His Message*, *in* THE CREATIVE PROCESS 36, 39 (Brewster Ghiselin ed., 1952).

[255] SIMONTON, *supra* note 149, at 32. Though there is significant similarity of cognitive processes for creativity in the arts and sciences, there is also evidence of

Artists' and scientists' struggles to describe their own creativity are matched by researchers' limited understanding of what exactly occurs cognitively during the creative process.[256] Evaluators' difficulty in describing why they perceive something to be, or not to be, creative — a task that people find extremely difficult — matches this challenge.[257] Intriguingly, despite the difficulty of describing why something is or is not creative, both lay people and experts are remarkably consistent across individuals in judging artistic, verbal, and problem-solving creativity.[258] When it comes to creativity, people generally are not able to describe it, but they do know it when they see it.

5. The Creative Process

Scientific and artistic creativity are not only more integrated than the common cultural conception, but they are also routinely more collective. The discussion of Eastern conceptions of the creative process provided above highlights that, like the dichotomous stereotypes of artistic versus scientific creativity, the individualization of creation in the United States is also both inaccurate and problematic. The romantic myths of the solitary author in her garret or solitary inventor in his garage are socially and culturally constructed and have been debunked by various scholars.[259] The historic examples of iconic inventors used earlier (Edison, Bell, and Salk), for example, did not unitarily achieve their inventions; their work was only accomplished within a framework of many prior advances and much concurrent collaboration.[260] Edison, for example, had a huge laboratory full of engineers conducting research on the light bulb.[261] He not only relied on the work of many before him, but

personality differences. One study examining a variety of personality traits found creative people, whether artists or scientists, tend to be more open to new experiences, self-accepting, hostile, and impulsive. Feist, *supra* note 214, at 299-300. Creative artists, however, tend to be more emotionally instable, cold, and rejecting of group norms than scientists. *Id.*

[256] AMABILE, *supra* note 199, at 33.

[257] *Id.* at 62.

[258] *Id.* at 44-79.

[259] Jaszi, *supra* note 156, at 455-63; Sawyer, *supra* note 212, at 479-81.

[260] See, e.g., Guy De la Bédoyère, THE FIRST POLIO VACCINE 5 (2005) (noting importance of Salk's research team); Anton A. Huurdeman, THE WORLDWIDE HISTORY OF TELECOMMUNICATIONS 159-62 (2003) (recounting contributions to telephone made by Bell's assistant, Watson, and friend, Blake); Mandel, *supra* note 182, at 982-83 (discussing contributions of inventors before Edison and debate over who was actual inventor of light bulb).

[261] Mandel, *supra* note 182, at 979.

may even have taken his idea from Joseph Swan, a contemporary British inventor who prevailed over Edison in a patent dispute in England.[262]

The sociocultural staying power of the myth of the individual creator is particularly surprising considering that patent and copyright law are built to some extent on understanding that the myth is inaccurate. Both copyright and patent prohibit protecting particular ideas; one can protect the expression or physical embodiment of an idea, but not the idea itself.[263] Bare ideas are off-limits to intellectual property protection because it is crucial that ideas remain available in the public domain for future inventors and authors to build upon.[264]

Just because the myth of the individual inventor or author is generally inaccurate does not mean that individuals do not play any role in new creation. As Professor Cohen persuasively explains in the context of copyright, "it is neither individual creators nor social and cultural patterns that produce artistic and intellectual culture, but rather dynamic interactions between them."[265] The same can be said of technological innovation. Sir Isaac Newton famously wrote, "If I have seen a little further it is by standing on the shoulders of giants."[266] The "giants" of the past, as well as contemporary contributions, are necessary predicates to new creativity, but the person who figures out how to stand on their shoulders and see a little further has individually made a valuable contribution as well.

Creativity almost always requires combination — a combination of people, a combination of innovation, and a combination of cognitive processes. Rather than displaying opposite forms, truly inspired creativity, whether artistic or inventive, usually springs from a blend

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[262] *Id.* at 983.

[263] 18 AM. JUR. 2D *Copyright and Literary Property* § 21 (2008); 60 AM. JUR. 2D *Patents* § 70 (2008).

[264] Cohen, *supra* note 201, at 1170. This rationale explains the necessity of the merger and *scenes a faire* doctrines in copyright law, permitting the copying of expression necessary to enable the exchange of ideas. *Id.* at 1172. It also explains the experimental use defense to infringement in patent law, permitting others to infringe a patent for purposes of philosophical inquiry. Madey v. Duke Univ., 307 F.3d 1351, 1362 (Fed. Cir. 2002).

[265] Cohen, *supra* note 201, at 1153; *see also* MIHALY CSIKSZENTMIHALYI, CREATIVITY: FLOW AND THE PSYCHOLOGY OF DISCOVERY AND INVENTION 7, 23 (1996) (discussing interaction between individual and sociocultural context that produces creativity); Feist, *supra* note 214, at 302 (providing model of influence of personality on creativity that includes genetic, social, and motivational influences); Madison, *supra* note 201, at 1587-88, 1679 (noting importance of cultural and social context to authorship).

[266] PATRICIA FARA, NEWTON: THE MAKING OF GENIUS 207 (2004).

of both analytic and intuitive ingenuity.[267] Too much intuitive dominance and the output may be highly original, but will lack appropriateness — the invention will not function or the art will not be aesthetically interesting. Too much analytical dominance and the output may be appropriate, but will be mundane or rote — the work of a person of ordinary skill in the art. An exquisite mix of analytical and intuitive creativity, however, can work wonders — producing illustrious artistic expression and imaginative technological innovation.

III. THE PERILS OF STEREOTYPING CREATIVITY

The importance of creative endeavors to society can hardly be overstated. Entire civilizations are measured by the creative achievements of their constituents.[268] There are numerous paradigmatic examples: ancient Greece, Persia, and China; Europe during the Renaissance; the Industrial Revolution; and the modern valuation of American, European, and Asian technological advance. Legal regimes that promote creativity are highly valuable; those that hinder creativity are greatly problematic.

Certainly, the objectives of intellectual property law are highly contested. Much ink has been spilled concerning whether the goals of intellectual property should be to incentivize the creation, the disclosure, or the commercialization of new works.[269] Some commentators argue for more complex objectives concerning balancing the incentives among various potential creators across time; others argue for substantially different goals, including natural rights, rewarding innovation, and securing an environment for greater human flourishing.[270] Usually ignored in these debates is that most intellectual property law theories share a common ambition: a desire, at base, that

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[267] AMABILE, *supra* note 199, at 33-34; SIMONTON, *supra* note 149, at 70-71.

[268] SIMONTON, *supra* note 149, at 1.

[269] *See generally* LANDES & POSNER, *supra* note 6, at 37-84 (discussing incentive theories of intellectual property); Rebecca Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, 56 U. CHI. L. REV. 1017 (1989) (discussing various incentive theories of patent law).

[270] *See, e.g.*, Cohen, *supra* note 201 (discussing effects of society and culture on copyrightable works); Fromer, *supra* note 7 (manuscript at 15-16) (discussing utilitarian and natural rights theories of intellectual property); Justin Hughes, *The Philosophy of Intellectual Property*, 77 GEO. L.J. 287, 337-44 (1988) (discussing rights and individual liberty theories of copyright); Robert Merges & Richard Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839 (1990) (discussing tradeoffs between pioneer and improvement inventors concerning breadth of patent scope).

intellectual property law promote creativity.[271] Promoting creativity can serve both the incentive goals of intellectual property and advance more holistic personal, cultural, and social interests as well.

A. The Objectives of Joint Creator Doctrine

Simply revealing that joint creator law is based, in part, on stereotypes of creativity and romantic myths about creators, does not demonstrate that there is anything problematic about the doctrine. Regardless of the accuracy of creativity stereotypes or truth of creator myths, the fundamental question is whether existing joint creator law "promote[s] the Progress" to the fullest extent feasible.[272] Joint creator law should be reformed not because social stereotype and myth have influenced its current form, but because they have produced doctrine that does not best serve the creativity-promoting goals of intellectual property law. The following discussion reveals that reliance upon mistaken stereotypes of creativity has led to a system that does not appear to promote intellectual creation optimally. Analysis of interdisciplinary research on creativity reinforces this conclusion and yields valuable insight for how intellectual property law can better promote creativity and collaboration.

1. Efficiency and Equity Objectives

Joint creator laws effectively establish a set of default rules for allocating rights between the primary developer of an invention or artistic work and a more modest secondary contributor.[273] Contributors are free to negotiate around the default rules, but in the absence of such negotiation, default joint creator law applies. Under this view, rules that favor joint rights will advance or protect the interests of the secondary contributor, while rules that disfavor joint rights advance or protect the interests of the dominant contributor.

Requiring intent to be a joint creator thus privileges the primary creator. Similarly, elevating the standard of contribution necessary for joint rights will advantage dominant creators over nondominant contributors. The opposite rules would favor secondary collaborators, as would rules that grant modest contributors substantial rights. Based on this understanding, copyright's joint author laws appear to prefer protecting the dominant author at the potential expense of a modest

[271] Boggs, *supra* note 202, at 889.

[272] U.S. CONST. art. I, § 8, cl. 8.

[273] Joint creator laws, of course, also allocate rights between multiple equal contributors, although issues in such situations rarely appear to lead to dispute.

contributor, while patent's joint inventor laws defend the minor contributor from the dominance of the primary inventor.[274]

From this perspective, despite their equitable origins, neither joint author nor joint inventor law appears particularly favorable as a matter of equity. Why should either the dominant or nondominant contributor be privileged over the other? One could argue that default rules should protect the nondominant author as the dominant author will often be more sophisticated and better able to self-protect. But, if this is the common wisdom, we would expect joint author doctrine to adhere to this rule (which it does not) rather than joint inventor doctrine (which does), as copyright takes into account notions of equity more often than patent law.[275] In addition, although dominant creators will sometimes be more sophisticated, this is hardly always the norm. Common counterexamples include independent authors, songwriters, or scientific researchers (all dominant contributors) who deliver their work product to institutional editors, producers, or institutional joint ventures (more sophisticated secondary contributors).

Information-forcing goals are another way to explain certain default rules,[276] but again appear unsatisfactory here. Joint author law could be considered information-forcing in encouraging modest contributors to identify the intent of primary authors beforehand or risk dire consequences. But, it is unclear why we would want to put this onus on modest contributors, particularly as it would often allow the primary author to take advantage of them. Similarly, it is unclear why the rule would be the opposite for patent law.

If joint creator laws cannot be justified on the basis of equity, perhaps they can be defended by principles of equity's counterpart, efficiency. After all, as discussed above, the commonly accepted goals of intellectual property law are efficiency goals — "to promote the progress."[277] It is also unclear from an efficiency perspective, however,

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[274] *See* Robert Harris, *Conceptual Specificity as a Factor in Determination of Inventorship*, 67 J. PAT. & TRADEMARK OFF. SOC'Y 315, 334 (1985) (stating that post-1984 Amendment patent decisions "evince a marked judicial inclination to favor the inventorship claim of the person who has done the nitty-gritty detailed work involved in creating the operable invention"); Kwall, *supra* note 64, at 52 (discussing joint author doctrine privileging dominant over nondominant authors).

[275] Burk & Lemley, *supra* note 161, at 1597-99; Wiley, *supra* note 3, at 119.

[276] *See* Bradley Karkkainen, *Information-Forcing Environmental Regulation*, 33 FLA. ST. U. L. REV. 861, 861 (2006) (discussing use of regulations for information-forcing purposes).

[277] KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 427 (2007) ("the results of ordinary innovation are not the subject of exclusive rights under the patent laws. Were it

why joint author and inventor rules would present such different requirements.

Joint author law, for example, appears to display a bias against collaborative authorship. Professor Roberta Kwall identified this bias explicitly in the Ninth Circuit's leading joint authorship case, concerning rights in Spike Lee's movie *Malcolm X*, in which the court appeared fixated on identifying a single author of a work, as opposed to recognizing the possibility of multiple contributors.[278] At first glance, this might seem efficient in certain circumstances, including the production of motion pictures and other complex works. Imagine how difficult it would be to commercialize a movie if every contributor held a joint copyright interest. However, if the inefficiency concern for complex artistic works is so significant, one would expect it to be so for complex inventions as well. After all, complex inventions provide at least as much social value — consider a new vaccine or other medical breakthrough developed through the contributions of many individuals. If complex copyrighted works raise substantial efficiency concerns regarding exploitation and distribution, we would expect these concerns to be greatly heightened for certain patented inventions as well, and therefore expect that minor patent contributors would have their rights foreclosed even more strictly. The law, however, is exactly the opposite, providing nondominant contributors rights more readily in the patent context than in copyright.

Further, the joint author bias against collaborative work is unlikely to be efficient in promoting either the creation or dissemination of artistic works. The bias towards dominant authors in copyright law will cause some potential nondominant contributors to be wary of providing assistance on a project out of concern that they will not receive appropriate reward for their effort. Potential joint authors can contract around such problems, but contract negotiations and the potential for litigation increase the transaction costs of collaboration. The bias favoring dominant authors will, at the margin, reduce collaborative efforts and the production of collaborative works. Similarly, the bias favoring sole authorship will reduce distribution of

otherwise patents might stifle, rather than promote, the progress of useful arts."); Feist Publ'ns., Inc. v. Rural Tel. Serv., 499 U.S. 340, 349 (1991) (The "primary objective of copyright [is to] promote the progress of science and the useful arts"); *see also supra* note 263.

[278] Kwall, *supra* note 64, at 60 (referring to opinion in Aalmuhammed v. Lee, 202 F.3d 1227, 1232 (9th Cir. 2000), as "reveal[ing], the court is fixated on a definition of 'authorship' which embodies a single creative entity").

a work. Two authors who can independently exploit a work will tend to produce greater distribution of the work than just one.

Joint inventor law does not necessarily efficiently promote collaboration either. Patent law's preference for protecting the rights of nondominant contributors will lead some dominant researchers to be wary of involving potential nondominant contributors, out of fear of losing a disproportionate share of their patent rights.[279]

Certainly, joint creator laws do not dissuade all collaboration — lots of collaboration occurs. Some potential collaborators are entirely unaware of joint creator law, and potentially unaffected. Others are aware of joint creator laws and able to contract around them. In certain situations, other doctrines resolve these or similar issues. For example, the work-for-hire doctrine resolves certain of these problems in copyright law by granting the copyright to the entity that paid to have a work created, rather than the actual creator.[280] Patent law has no work-for-hire doctrine, but research organizations often solve these, and other, problems by contracting in advance for rights to employee inventions as a condition of employment.[281]

For parties between the extremes of full ignorance of joint creator laws and privately negotiated agreement, however, joint creator law matters at the margin. This group will include those who have an awareness of joint creator laws, but for whom the transaction costs of delineating rights ex ante are too great — either financially or because they do not want to be bothered with legal agreements or lawyers.[282] This group will also include those who are not directly aware of joint creator laws, but who operate within a social culture of heightened concern about being treated fairly if one contributes to an endeavor.[283] Contributors often do not adequately consider their intellectual property rights beforehand, or even if they do, rarely pay enough

[279] This does not necessarily mean that the 1984 Patent Act Amendments negatively impacted joint inventor law, only that additional problems still exist. *See* Lawrence Sung, *Collegiality and Collaboration in the Age of Exclusivity*, 3 DEPAUL J. HEALTH CARE L. 411, 439 (2000).

[280] 17 U.S.C. § 201(b) (2006). A work is classified as a work-for-hire if it is "prepared by an employee in the scope of his or her employment." 17 U.S.C. § 101 (2006). Certain types of works, including motion pictures, are classified as works for hire if the parties agree in writing. *Id.*

[281] Fisk, *Law and the Employee-Inventor*, *supra* note 12, at 1131. Patent law does have a common law shop right doctrine that grants employers a non-exclusive license in any invention made through use of the employers' resources. *Id.*

[282] *See* Dreyfuss, *supra* note 111, at 1172 ("many scientists and artists have cultural aversions to lawyers and legal matters.").

[283] Sung, *supra* note 279, at 435-38 (discussing how law of joint inventorship has led to anxiety among researchers about exchanging information).

attention to clearly define their respective rights by contract.[284] Even when potential collaborators develop a private agreement delineating intellectual property rights, the contract may turn out to be insufficiently comprehensive or unclear in the hindsight of a dispute.[285] The recent rise in joint creator litigation makes evident the difficulties and costs of private solutions.[286]

The challenge of achieving sufficient and comprehensive private agreements is a particular problem for intellectual property endeavors because the goal of such agreements is often to develop something uncertain and unknown. These problems lead not only to disputes over rights, but also to a lack of clarity over rights that can make it unclear how the output may be exploited or further developed. Such uncertainties can lead to underutilization of a valuable creation.[287] A prime example concerns the dispute over rights related to the identification of the AIDS virus. Two prominent scientists at the National Cancer Institute and Pasteur Institute exchanged virus samples, a common form of collaboration in their field.[288] Their work led to the discovery of the AIDS virus, creating the possibility for highly profitable research into diagnostic tests and vaccines for AIDS.[289] Resulting disputes over patent and attribution rights, however, drained potential scientific resources into litigation and delayed critical research in these areas.[290]

All of these effects also impact the common culture around collaborative research, such that even those who may be personally unaware of joint creator laws now operate in an atmosphere shaped by the doctrine. The effect of a general culture of concern around collaborative work is documented in reports that reveal the negative impact of apprehension around joint creator rights on scientific researchers and authors.[291]

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[284] Dreyfuss, *supra* note 111, at 1165.

[285] *See id.* at 1169-82 (discussing number of examples where private agreements failed, either because they were not properly entered or because they were not sufficiently comprehensive).

[286] Sean Seymore, *My Patent, Your Patent, or Our Patent? Inventorship Disputes within Academic Research Groups*, 16 ALB. L.J. SCI. & TECH. 125, 150 (2006); Sung, *supra* note 279, at 435; *see* Ethicon Inc. v. U.S. Surgical Corp., 135 F.3d 1456, 1472 (Fed. Cir. 1998) (Newman, J., dissenting).

[287] Dreyfuss, *supra* note 111, at 1165, 1176-77; Sung, *supra* note 279, at 435-38.

[288] Dreyfuss, *supra* note 111, at 1173.

[289] *Id.* Their discovery of the AIDS virus may have occurred as the result of inadvertent cross contamination of the samples.

[290] *Id.*

[291] *See, e.g.*, THE LAW AND STRATEGY OF BIOTECHNOLOGY PATENTS 138 (Kenneth D.

The deleterious effect of joint creator law on collaboration is likely to have the greatest negative impact on small firms, start-up entities, and certain university-based creators. Large firms generally are more sophisticated in handling intellectual property rights and will often have sufficient expertise in house to attempt to avoid most problematic effects of joint creator law. Small firms, start-ups, and university creators who act more independently, however, often will lack this expertise and are more likely to fall victim to the disincentive effects of joint creator law.

The negative effects of current joint creator laws are impossible to quantify, but both the evidence described above and the recent rise in joint creator litigation demonstrate that the problems are real. Much collaboration still takes place in both science and the arts, but we do not know how much more collaboration would occur, or how much more valuable such collaboration would be, under a superior legal regime.

2. Collaboration and Creativity

The disincentive effects of joint author and joint inventor law on collaboration may have been less troubling when the doctrines developed a century or two ago, but they are highly problematic today because such an overriding proportion of valuable inventions are the result of collaboration, and a significant and growing amount of artistic works are as well.[292] Collaboration has become both more common and more necessary across numerous technological and artistic fields.[293] Congress recognized this in the 1984 Amendments to the Patent Act, designed to promote team research.[294] The trend towards collaboration is also evident in patent filings, where the

Sibley ed., 1994) (noting that issue of inventorship is "constant source of confusion" for collaborative team work); Boggs, *supra* note 202 (discussing issues of joint creator interaction and rights); Sung, *supra* note 279, at 435-38 (discussing how law of joint inventorship has led to anxiety among researchers about exchanging information).

[292] Dreyfuss, *supra* note 111, at 1162 ("The creative industries [the arts and sciences] have evolved: collaborative production is replacing individual effort."); Kwall, *supra* note 64, at 63-64; Sung, *supra* note 279, at 416-19.

[293] INT'L EXPERT GRP. ON BIOTECHNOLOGY, INNOVATION, AND INTELLECTUAL PROP., TOWARD A NEW ERA OF INTELLECTUAL PROPERTY: FROM CONFRONTATION TO NEGOTIATION 42 (2008) (report concluding that current intellectual property system discourages collaboration, retarding biotechnology development); Dreyfuss, *supra* note 111, at 1162-63; Fisk, *Norms of Attribution*, *supra* note 155, at 82; Sibley, *supra* note 89, at 338-39.

[294] *Section-by-Section Analysis*, *supra* note 26, at 5833.

average number of inventors listed per patent has increased by fifty percent from the 1970s to the 2000s.[295]

As Professor Rochelle Dreyfuss points out, the extraordinarily advanced achievements and specialization that have occurred in contemporary society mean that individuals often do not have the intellectual capacity to make further advances without collaboration.[296] The entire field of nanotechnology, for example, involves advanced aspects of physics, chemistry, and biology such that multidisciplinary collaboration is essential for most work.[297] Collaboration is also increasing in the arts, for instance, to produce more complex works or works that will appeal to individuals across a wide range of cultures.[298] Professors Yochai Benkler, Arti Rai, Katherine Strandburg, and others have explored a new form of complex creation, involving open and collaborative peer production, which is critically dependant on vast networks of individuals working towards a common goal.[299] Peer production involves widely dispersed contributions by individuals who may not even know each other, and is revolutionizing development in fields as diverse as software and biotechnology.[300]

A variety of psychological and sociological research demonstrates the importance of collaboration to promoting creativity in both the arts and the sciences. Experiments reveal that individuals exposed to strongly unrelated images generate more creative artistic outputs than

[295] Dennis Crouch, *The Changing Nature of Inventing: Collaborative Inventing*, PATENTLY-O BLOG, (July 9, 2009) http://www.patentlyo.com/patent/2009/07/the-changing-nature-inventing-collaborative-inventing.html (reporting average of 1.6 inventors listed per patent in 1970s and 2.5 inventors listed per patent in 2000s).

[296] Dreyfuss, *supra* note 111, at 1162, 1216.

[297] Gregory Mandel, *Nanotechnology Governance*, 59 ALA. L. REV. 1323, 1328-31 (2008); *see* Dreyfuss, *supra* note 111, at 1162 (making similar point for biotechnology).

[298] Dreyfuss, *supra* note 111, at 1162; *see also* Madison, *supra* note 201, at 1686 (discussing value of making "connections between previously unconnected phenomena").

[299] YOCHAI BENKLER, THE WEALTH OF NETWORKS: HOW SOCIAL PRODUCTION TRANSFORMS MARKETS AND FREEDOM 1-8 (2006); Arti Rai, *Open and Collaborative Research: A New Model for Biomedicine*, *in* INTELLECTUAL PROPERTY RIGHTS IN FRONTIER INDUSTRIES 131, 131-34 (Robert W. Hahn ed., 2005); Katherine Strandburg, *Evolving Innovation Paradigms and the Global Intellectual Property Regime*, 41 CONN. L. REV. 861, 878-89 (2009).

[300] *See* BENKLER, *supra* note 299, at 59-90 (discussing peer production in software, information, and other contexts); Rai, *supra* note 299, at 140-45 (discussing open and collaborative software, database, and biomedical peer production); Strandburg, *supra* note 299, at 878-89 (discussing peer production in software, agriculture, and biotechnology).

those not so exposed, as judged by independent raters.[301] Studies also find that more creative scientists, as judged by reputation level and productivity, tend to have a greater ability to draw from a broader array of resources when solving problems.[302] Similarly, scientists whom peers identify as the most creative are more likely to have had exposure to information from different scientific disciplines.[303] Collaboration increases the likelihood of scientists and authors encountering widely different phenomena, experiences, and resources. The most significant intellectual revolutions in history, including the Renaissance and the Scientific and Industrial Revolutions, may be significantly attributable to conceptual cross-pollination across different fields.[304]

Psychologists identify a number of cognitive processes that can produce creative outputs. "Associative richness" is one of the primary processes, referring to the capacity to connect different ideas in unusual ways.[305] Results tend to be judged as more creative where the connected concepts are more widely varied.[306] As Einstein explained, "combinatory play seems to be the essential feature in productive thought."[307] Professor Cohen makes a similar point in studying the impact of culture on creativity, "A critical ingredient [in creativity] is the 'play' that the networks of culture afford, including . . . the extent to which they enable serendipitous access to cultural resources and facilitate unexpected juxtapositions of those resources."[308] The opportunity for associatively rich connections will increase with collaboration.

Studies of invention indicate that extraordinary innovation usually arises from integrating teachings from disparate fields, an outcome

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[301] SIMONTON, *supra* note 149, at 46.

[302] Sarnoff A. Mednick, *The Associative Basis of the Creative Process*, 69 PSYCHOL. REV. 220, 223 (1962).

[303] AMABILE, *supra* note 199, at 87.

[304] *See generally* Sean O'Connor, *The Central Role of Law as a Meta Method in Creativity and Entrepreneurship* (2009) (draft on file with author) (discussing both Renaissance and Scientific Revolution advances as "largely the result of a fruitful cross-pollination of methods from different fields").

[305] SIMONTON, *supra* note 149, at 28; *see also* Sawyer, *supra* note 212, at 465-67 (discussing "conceptual combination" as type of creativity that can lead to innovation).

[306] SIMONTON, *supra* note 149, at 28; Sawyer, *supra* note 212, at 465-67.

[307] SIMONTON, *supra* note 149, at 29.

[308] Cohen, *supra* note 201, at 1190; *see also* DACEY & LENNON, *supra* note 137, at 88-93 (discussing role of culture in creativity).

also much more likely in collaborative research.[309] Research similarly reveals that paradigm shifts in scientific understanding are often achieved by scientists who are trained in an original field and then migrate to a new one.[310] Related findings have been made in the arts, where representational shifts often result from an artist trained or working in one creative tradition encountering works or techniques from another.[311]

As E.M. Forster famously wrote in the epigraph to the novel *Howard's End*, the most important thing is to "[o]nly connect."[312] The potential for access to, comparison of, and connection among differing information will increase as collaboration increases. Collaboration, in short, promotes creativity, and intellectual property law should therefore promote collaboration.

B. Promoting Collaboration and Creativity

Research from a variety of disciplines makes clear that collaboration is a valuable driver of creative achievement. Consequently, intellectual property law should generally try to promote, and at a minimum not hinder, joint endeavors.

In addition to the benefits of promoting greater creativity in the ex ante production of artistic works and inventions, there is an additional ex post reason to promote collaboration. Once a work or invention has been achieved, joint interests generally will benefit society more than sole interests. Because both patent and copyright provide all authors equal rights to exploit their joint creations, joint rights should lead to greater distribution of completed work product.

Existing joint author and joint inventor law, however, appears to deter collaboration. The analysis indicates that rules favoring either dominant or nondominant contributors both disincentivize collaboration, a conclusion that may appear paradoxical at first. The solution to this quandary, however, is to break away from law's customary all-or-nothing outcome strictures and instead to implement doctrine that provides for equitable allocation of rights in joint works and joint inventions. Joint author and joint inventor law can also be improved by switching to standards based on whether a collaborator has made a non-market-substitutable contribution to creative output. The following sections explore these proposals.

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309 Sawyer, *supra* note 212, at 480-81.

310 SIMONTON, *supra* note 149, at 123-25.

311 Cohen, *supra* note 201, at 1190-91 (collecting examples).

312 E.M. FORSTER, HOWARD'S END 3 (Alfred A. Knopf 1921).

1. Equitable Allocation of Joint Creator Rights

Allocating joint creator rights in proportion to each collaborator's contribution could produce outcomes that are both more efficient in promoting collaboration and more equitable.[313] The outcomes would be more efficient because they would provide the proper incentives to potential collaborators — both to collaborate and to produce creative works. The outcomes would be more equitable because each joint creator would be rewarded in appropriate proportion to his or her contribution.

The current all-or-nothing rules of joint authorship and joint inventorship make the results in many cases problematic, and render the disparate rules between patent and copyright easy to criticize. Existing law produces substantial distinctions in joint creator rights based on seemingly irrelevant distinctions between artistic versus scientific creativity. Consider a research assistant who aids a lead researcher in a laboratory. Assume the assistant provides some (not insubstantial) contribution to the conception of one part of a multifaceted invention, but is relatively uninvolved in the rest of the technological accomplishment. The same research assistant also contributes quite extensively to the article reporting the invention, including describing the invention far more insightfully than the lead researcher could have.

If the ensuing patent contains a single claim covering the ancillary contribution of the research assistant, the assistant will be entitled to an equal, undivided interest in the entire patent, including the broadest claims covering the entire invention. If the lead researcher, however, did not intend the assistant to be a joint author of the article, the assistant will have no joint author rights. These disparate results are hard to justify. The dichotomy between joint author and joint inventor doctrine highlights the weaknesses in each. Equitable apportionment of rights would resolve both problems.

Equitable apportionment would also resolve concerns that may have produced some of the more criticized aspects of joint author law in the first instance. The development of the strong intent and independent copyrightability requirements, for example, appears to have resulted from concern that modest contributors not be awarded equal (and undeserved) shares in a copyright.[314] Rather than distorting the

[313] *See* Dreyfuss, *supra* note 111, at 1220 (recommending new statutory category of work besides works for hire and joint authorship, called "collaborative work," that would provide proportional rights).

[314] *See, e.g.*, Aalmuhammed v. Lee, 202 F.3d 1227, 1235-36 (9th Cir. 2000) (raising concerns about "extend[ing] joint authorship to many overreaching contributors");

socially desired incentives with doctrine that disadvantages secondary authors, another solution to this problem is equitable rights: a modest contributor would only be entitled to a correspondingly modest interest in the copyright.

The all-or-nothing consequences of current joint creator law arise from the fact that joint creators own their intellectual property interests as tenants in common, a form of ownership derived from real property law.[315] Because tenants in common each own an undivided interest in their property, courts reason, their interests must be split equally.[316] Blackletter real property law, however, does not require this — "undivided" does not refer to equal shares, but can involve dividing property rights in any fraction whatsoever.[317]

Although hardly the norm, equitable apportionment has a small foothold in international intellectual property law. Japan awards damages in copyright infringement lawsuits to co-authors in proportion to their contribution to a work.[318] Japanese patent law remains somewhat unclear as to whether it follows the same rule.[319] Recently, British courts have taken a similar approach, occasionally awarding joint authors unequal shares in a joint work, based upon the scope of each individual's contribution.[320]

More efficient and equitable default rules could have many benefits for potential collaborators, actual collaborators, and society at large. Such rules can reduce transaction costs ex ante by providing a more mutually acceptable status quo, thereby reducing the need for and costs of private negotiation.[321] These rules can also reduce transaction (including litigation) costs ex post by filling unrecognized gaps in

Childress v. Taylor, 945 F.2d 500, 508 (2d Cir. 1991) (noting that consideration of joint author's intent "is especially important in circumstances, such as the instant case, where one person (Childress) is indisputably the dominant author of the work," and indicating concern about nondominant authors obtaining equal rights).

[315] Ethicon Inc. v. U.S. Surgical Corp., 135 F.3d 1456, 1470-71 (Fed. Cir. 1998) (Newman, J., dissenting); H.R. REP. NO. 94-1476, at 121 (1976).

[316] *See Ethicon*, 135 F.3d at 1472 (holding joint inventors hold equal interests in patent even if inventors contributions were not equal); Cmty. for Creative Non-Violence v. Reid, 846 F.2d 1485, 1497 (D.C. Cir. 1988) (holding that joint author profits are equally divided even if authors' contributions were not equal).

[317] 20 AM. JUR. 2D *Cotenancy and Joint Ownership* § 117 (2009).

[318] 著作権法 [Copyright Act], Law No. 48 of 1970, art. 117, translated in http://www.japaneselawtranslation.go.jp/law/detail/?id=56&vm=04&re=02&new=1 (Japan).

[319] LaFrance, *supra* note 123, at 90.

[320] *E.g.*, Fisher v. Brooker, [2006] EWHC (Ch) 3239, [98] (appeal taken from Eng.).

[321] Dreyfuss, *supra* note 111, at 1166.

agreements.[322] Part of the rise in litigation over joint rights has included numerous cases in which a contract had been negotiated, but turned out to be incomplete after the fact.[323] Importantly, improving efficiency and equity not only advances social welfare in and of itself, but creates an environment that will optimize incentives for collaboration, as opposed to the current environment of concern, and such an environment should lead to more advanced innovation and artistic expression.

Rules of apportionment could be developed judicially, without the need for legislative action. This would require courts to divorce, conceptually and legally, the concept of equal ownership from that of joint inventorship and joint authorship. An individual who is a joint author or joint inventor need not be an equal co-owner of the underlying intellectual property. Nothing in the Patent Act or Copyright Acts precludes this differentiation. The Patent Act does not tie joint inventorship to equal ownership interests; as discussed above, Judge Newman recommended severing joint inventorship and equal ownership in her dissent in *Ethicon*.[324] The Copyright Act states that "[t]he authors of a joint work are coowners of copyright in the work," but does not require that they be equal co-owners.[325]

One intriguing and seemingly irrational aspect of current doctrine is that there is little practical difference between owning a one-half undivided interest in a patent and owning a one-tenth undivided interest. Each party has equal rights to exploit and assign the invention; neither has a duty to account to the other.[326] Copyright is similar, but due to the accounting requirement in copyright, joint author doctrine does produce differentiation between different proportional shares.[327] Equitable apportionment doctrine would resolve these enigmatic results.

Equitable apportionment is hardly a perfect solution. One concern is whether it would produce new costs and litigation that are avoided under existing law. For example, under current law, joint creator litigation need not resolve ownership shares. If equitable

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[322] *Id.*

[323] *Id.* at 1169-82.

[324] 35 U.S.C. § 116 (2006); Ethicon Inc. v. U.S. Surgical Corp., 135 F.3d 1456, 1469-70 (Fed. Cir. 1998) (Newman, J., dissenting).

[325] 17 U.S.C. § 201(a) (2006).

[326] 35 U.S.C. § 262 (2006); Merges & Locke, *supra* note 43, at 589.

[327] MELVILLE B. NIMMER & DAVID NIMMER, NIMMER ON COPYRIGHT § 6.12(B) (rev. ed. 2008); Notes, *Accountability among Co-Owners of Statutory Copyright*, 72 HARV. L. REV. 1550, 1563-64 (1959).

apportionment results in much litigation concerning how to apportion ownership interests, its transaction costs could exceed its benefits. This seems unlikely to occur. First, most parties that contract around the current default rules generally already work out some (often unequal) division of interests. Disputes arising out of agreements that are unclear or not comprehensive in hindsight often will still provide set allocation rights. Second, under current law, minor contributors are over-incentivized to litigate their rights due to the potential windfall of equal co-ownership. Equitable apportionment would reduce the stakes of expected outcomes from litigation, which would be expected both to reduce litigation and to increase the rate of settlement of any litigation that is initiated.[328] Third, although the equitable allocation approach will require courts to consider the additional issue of proportional contribution by each joint creator, providing a continuum rather than an all-or-nothing rule should make negotiated settlements more likely, reducing overall litigation expenses.[329] Last, equitable apportionment hopefully will shift the culture around collaboration from the current atmosphere of concern about rights and relationships to a more positive atmosphere encouraging interaction, as there will be less worry about one's contribution being unfairly valued. As a result, there may be fewer legal disputes in the first instance.

A second challenge for equitable apportionment could involve a long-running concern, at least in copyright, regarding attempts to value the artistic merit of a work. This is the concern that led to the current minimal originality threshold for copyright protection.[330] Justice Holmes illuminated the problem when he wrote, "It would be a dangerous undertaking for persons trained only to the law to constitute themselves final judges of the worth of pictorial illustrations."[331] There is a significant difference between Holmes'

[328] *See* George Priest & Benjamin Klein, *The Selection of Disputes for Litigation*, 13 J. LEGAL STUD. 1, 5-6 (1984) (discussing effect of expected outcomes on litigation decisions).

[329] *See, e.g.*, Alberto Galasso & Mark Schankerman, *Patent Thickets and the Market for Innovation: Evidence from Settlement of Patent Disputes* (Ctr. for Econ. Policy Research, Working Paper No. 6,946, Aug. 2008), *available at* www.cepr.org/pubs/dps/DP6946.asp (reporting faster settlement agreements where there is greater certainty in outcome).

[330] Bleistein v. Donaldson Lithographing Co., 188 U.S. 239, 251-52 (1903).

[331] *Id.* It is unclear why persons "trained only to the law" can nevertheless constitute themselves final judges of the innovation present in technological invention, but that is a topic for another article. *See generally* Gregory Mandel, *The Non-Obvious Problem: How the Indeterminate Non-Obvious Standard Produces Excessive Patent Grants*, 42 UC DAVIS L. REV. 57 (2008) (discussing challenges of having non-

concern about value-neutral copyright protection and the question of apportioning collaborator rights. Holmes' primary concern was to avoid judges picking winners and losers in the marketplace of ideas.[332] Apportioning collaborator interests does not involve awarding or denying copyright protection for the work in the first instance, and therefore does not affect the marketplace of ideas in this value-laden manner.

There is no question that it will be analytically difficult to measure the share of a collaborator's contribution, in copyright or patent. Measuring contribution, however, is something that courts already do to some extent in each joint creator case when judging whether a contribution was independently copyrightable or contributed to the conception of an invention. Determining relative contributions is more challenging than the existing binary standard, but this is a difference of kind, not type. Judges in Japan and Britain already engage in such determinations and have been able to do so successfully without critical outcry. Importantly, in order for apportionment to provide a fairer and more accurate incentive than the current rules, judges need not be able to identify the proportion of each contributor's contribution exactly but only to be able to do so more accurately than current doctrine. Because the current law provides only equal rights or no rights, it would practically require intentional misfeasance for judges to do worse under an equitable apportionment regime, and it is highly likely that judges can surpass this modest benchmark. If judges and jurors can apportion tort liability based on degree of contribution to an accident in comparative negligence jurisdictions,[333] there is no reason they cannot apportion contributions to creative works and inventions sufficiently as well.[334]

2. Requiring a Nonmarket Contribution for Joint Creator Rights

Providing equitable apportionment for joint authors and joint inventors would resolve a number of incentive and other issues, but does not answer how to determine when someone has made a

expert judges and juries evaluate nonobviousness of technological inventions).

[332] *Bleistein*, 188 U.S. at 251-52.

[333] *See* Hilen v. Hays, 673 S.W.2d 713, 719-20 (Ky. 1984) (adopting pure comparative negligence); 18 AM. JUR. 2D *Contribution* § 69 (2008).

[334] Consistent with this hypothesis, some scientists have argued that for attribution purposes scientific articles should identify the relative percentile contribution of each author after their name. *See, e.g.,* Letter, William Foulkes & Norah Neylon, *Relative Contribution Should be Given After Each Author's Name*, 312 BRIT. MED. J. 1423, 1423 (1996).

contribution sufficient to be a joint author or joint inventor in the first instance. Research on creativity and collaboration provides useful insights for how to improve joint creator law in this regard as well.

Joint author and joint inventor status should turn on whether a contributor has made a "non-market-substitutable contribution" to the artistic work or invention.[335] A non-market-substitutable contribution requires what it sounds like — a contribution beyond that which would have been expected from ordinary assistance available in the marketplace or assistance that could have been obtained from information already in the public domain. Those who make only market-substitutable contributions to a work have not provided enough creativity to deserve joint rights; they have not sufficiently promoted progress. This standard would replace copyright law's intent and independent copyrightability standards, and replace patent law's requirements of a not insignificant, nonpublic domain, contribution to conception.

A nonmarket contribution standard provides only modest substantive changes to joint inventor law, but would clarify it and consequently make its application easier. The primary change is that the nonmarket standard would resolve current ambiguity concerning whether only a contribution to conception of an invention is satisfactory, or whether a contribution to the reduction to practice of an invention can ever suffice for joint inventorship status.[336] Under the nonmarket standard, contributing to the reduction to practice of an invention would suffice where reduction to practice was not available in the market.

Patent law currently provides that contributing information already in the public domain is insufficient to establish joint inventorship, and the nonmarket rule would not change this. Joint inventor law, however, also requires that a contribution be "not insignificant" when measured against the full invention, but provides essentially no guidance concerning what this standard requires. The nonmarket contribution rule clarifies the necessary input — it must be a greater contribution than the primary inventor could have found a substitute for in the market at the time the contribution was provided.

The nonmarket contribution standard would not notably change the independent copyrightability element of joint authorship doctrine.

[335] *See* Steven Kan, Attribution Determination for True Inventors and Authors 11-12 (Jan. 21, 2008) (unpublished manuscript), *available at* http://www.ssrn.com/abstract=1086233 (discussing non-market substitutable knowledge as basis for attribution rights).

[336] See *supra* note 40 for discussion of this current ambiguity.

Importantly, it would continue to provide a bulwark against the Supreme Court's concern that too low a copyright standard would produce an infinite regress of copyright owners, a concern shared in other joint authorship cases as well.[337]

The nonmarket substitutable standard, however, would have more substantial impact on copyright doctrine. In particular, it would eliminate the intent requirement for joint authorship. As discussed above, this requirement has been heavily criticized for being unfair to nondominant contributors, creating a subjective standard that is hard to evaluate, and potentially allowing dominant authors to engage in trickery. The intent requirement appears to have been created out of concern that minor assistants not be afforded equal rights in a work to which they made only a modest contribution.[338] The nonmarket standard satisfies this legitimate goal while doing away with the problems affiliated with the intent requirement. It also provides an easier standard for courts to evaluate, rather than requiring courts to delve into the long-ago intent of a person who may have significant incentives to lie about their past intent or who may no longer be alive.

Outcomes under the nonmarket standard would accord well with precedential analysis of who merits joint authorship. An editor, for example, who performs routine editing work, though making an independently copyrightable contribution, is not a joint author.[339] So too, a research assistant, secretary, or draftsperson who performs routine duties would not be entitled to joint rights, in accord with case law.[340] A collaborator who provides and gives expression to original concepts "beyond general ideas, refinements, and suggestions," even if such contributions make up a relatively minor portion of the work, is entitled to be a joint author.[341] In addition, the nonmarket standard

[337] Dastar Corp. v. 20th Century Fox Film Corp., 539 U.S. 23, 35 (2003); Gaiman v. McFarlane, 360 F.3d 644, 658-59 (7th Cir. 2004) (noting that if standard for contribution is too low, "almost every expressive work would be a jointly authored work, and copyright would explode").

[338] Aalmuhammed v. Lee, 202 F.3d 1227, 1235-36 (9th Cir. 2000) (raising concerns that "Claimjumping by research assistants, editors, and former spouses, lovers and friends would endanger authors who talked with people about what they were doing, if creative copyrightable contribution were all that authorship required"); Childress v. Taylor, 945 F.2d 500, 507-08 (2d Cir. 1991); Dreyfuss, *supra* note 111, at 1206.

[339] *Childress*, 945 F.2d at 507.

[340] *See* Seshadri v. Kasraian, 130 F.3d 798, 803 (7th Cir. 1997) (discussing that such contributors are not entitled to joint authorship).

[341] Janky v. Lake Cnty. Convention & Visitors Bureau, 576 F.3d 356, 363 (7th Cir. 2009) (holding that collaborator who contributed ten percent of song's lyrics is entitled to joint authorship).

provides an objective standard for evaluating merit, rather than the subjective standard that concerned Judge Holmes in *Bleistein*.[342]

Some may question the suitability of these changes for copyright law, worrying that it will result in the fractionalization of copyright interests, with detrimental effects on the use and distribution of copyrighted works. Extant patent law, however, reveals that an analogous system can function well. In both areas, as discussed, ex ante contracting will resolve many issues. Where issues arise in the absence or interstices of contracts, the multiplicity of authors should result in greater, not reduced, distribution.

The nonmarket substitutable standard comes with the benefit of relating joint creator doctrine back to the contemporary psychological understanding of creativity. Generally, a contribution will not satisfy the nonmarket standard unless it is novel, appropriate, and heuristic. Where a contribution is algorithmic, it will only satisfy the nonmarket standard when it was not readily available. The nonmarket requirement is consistent with modern research on creativity, while providing a type of standard that judges and lawyers are familiar evaluating.

For those who recognize some similarity in the goals of copyright and patent law, the nonmarket standard has the added benefit of harmonizing one corner of patent and copyright doctrine. It does so not for the mere sake of harmonization, but because it is based on the underlying objectives of copyright and patent in the first instance — promoting creative accomplishment. The standard provides appropriate incentives by rewarding those who make a creative contribution that could not have been obtained in general and by not rewarding contributions which fall short of this mark.[343]

The nonmarket standard proposal is efficient because it allows inventors and authors to get assistance that is readily available in the market without having to risk joint rights, only awarding joint rights

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[342] *See, e.g.*, Gideon Parchomovsky & Alex Stein, *Originality*, 95 VA. L. REV. 1505 (2009) (proposing tiered level of copyright protection based on level of originality and creativity in work, and arguing that such level can be judged and differentiated).

[343] The nonmarket standard proposal could be criticized for relying too heavily on an individualistic model of creativity, when a thrust of this Article has been that novel works usually require collaboration of some form. Resolving issues of private group rights, however, is something that American law is poorly designed to handle and presents too fundamental a limitation to resolve here. *See* Philippe Cullet et al., *Intellectual Property Rights*, *Plant Genetic Resources and Traditional Knowledge*, *in* RIGHTS TO PLANT GENETIC RESOURCES & TRADITIONAL KNOWLEDGE: BASIC ISSUES & PERSPECTIVES 112, 117-18 (Susette Biber-Klemm & Thomas Cottier eds., 2006); Angela R. Riley, *Recovering Collectivity: Group Rights to Intellectual Property in Indigenous Communities*, 18 CARDOZO ARTS & ENT. L.J. 175, 191-94 (2000).

where a nonmarket contribution is made. In addition to efficiency, the nonmarket requirement appears equitable, awarding rights only when someone has made a deserving contribution.

Intellectual property doctrine often experiences a fracture concerning whether to adhere to economic or rights-oriented objectives, a challenge that similarly runs through many areas of law. Law's twin goals of equity and efficiency often lead to opposing outcomes. The proposed equitable apportionment and nonmarket substitutable standards, however, reveal that joint creator doctrine is one area where both objectives can be harmonized.

CONCLUSION

The Supreme Court has often explained that intellectual property law exists to promote creativity and the creation and distribution of creative works.[344] Joint author and joint inventor law, however, arose largely in ignorance of these fundamental objectives. Rather, joint creator doctrine appears to be driven, at least in part, by impoverished social stereotypes of artistic versus inventive creativity. This evolution has produced laws that discourage certain creative and collaborative work, and consequently may retard potentially great creative advances.

Multidisciplinary research in psychology, neurobiology, and cultural studies now provides a wealth of knowledge concerning the inaccuracies of common cultural stereotypes about right-brain artists and left-brain inventors. These insights not only reveal problems with current intellectual property law, but, even more importantly, provide valuable teachings concerning how to use the law to promote creativity and collaboration. This understanding provides important lessons for joint inventor and joint author doctrine, as well as for certain other areas in which patent and copyright law diverge, potentially including their creativity thresholds and the attribution, scope, and duration of intellectual property rights. Intellectual property law should mine the rich resources these other disciplines provide in order to reach its full potential to promote the progress in technology and the arts.

[344] See Jaszi, *supra* note 156, at 464.