

**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 versus those who seek to advance other social goals. Proponents of the former model focus on the need for intellectual property regimes to provide incentives, while proponents of the latter aspire to protect natural rights or secure an environment for greater human flourishing. Typically lost to both observers and participants in these disputes is that most conceptions of intellectual property actually share a common ambition—the desire to promote creativity. Promoting creativity serves both the incentive goals of intellectual property and advances more holistic personal, cultural, and social interests.

Psychological, neurobiological, and cultural research now provide a wealth of information on how to actually promote creativity. Unfortunately, intellectual property law has failed to recognize these insights, instead remaining moored in doctrine derived from archaic stereotypes about creativity and the creative process. We see these distorting stereotypes, for example, in the law concerning joint authors and joint inventors. Based on historical, textual, temporal, and comparative law evidence, this article argues that 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. Modern research shows that these stereotypes of creativity are not only false, but that as a result, joint creator law specifically, and intellectual property law more generally, likely do not promote progress to the extent feasible, hindering both creativity and valuable collaboration in important contexts. Leveraging these interdisciplinary teachings yields valuable insight for how to revise patent and copyright law to better serve their creative objectives.

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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 can do 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 versus inventive creativity differ significantly. Artistic creativity is commonly perceived as a more intuitive, holistic, and personal process. It is conventional 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 entails conventional left-brain cognition. These social perceptions have influenced intellectual property law.

Psychological, neurobiological, and cultural research, however, now reveal 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 nor how they are going to achieve it, and commonly produce inventions that were not their goal when they began. Inventions from Post-It notes to the microwave oven were achieved only because inventors thought in more holistic, less regimented manners. Conversely, artistic creation is not only intuitive, but also regularly involves logical cognitive processing and externally-mandated targets. The importance of such 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 than displaying opposite forms, 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 variance in form and function. Much of this divergence has historical roots. Consequently, the cause of many of the doctrinal differences between copyright and patent is often explained functionally, based upon the differing histories, differing subject matters, and differing standards and rights. These commonly held assumptions

about the genesis of intellectual property law, however, can actually be examined by comparing analogous areas of patent and copyright, and can be refuted, at least 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, inaccurate stereotypes about differences between the creative processes of artists versus inventors. Whether law-makers 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 concerns when an individual (such as a collaborator, assistant, or supervisor) has contributed enough to an endeavor to be entitled to be a joint inventor or joint author, and consequently entitled to concomitant patent or copyright rights. Joint creator law provides an informative example because the function of the doctrine in each field is similar and the doctrines developed after similarities between the objectives of patent and copyright law were well recognized. Though the 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 discrepancies are necessitated by the fields' different underlying subject matter, creativity thresholds, or intellectual property rights. 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 variance between joint inventor and joint author law, and the particular doctrine of each, is best explained by commonly held stereotypical biases in differing social attitudes towards the creativity and processes that produce technological innovation versus artistic expression. This analysis is based on the correspondence between creativity stereotypes and legal doctrine, the text of joint creator opinions, additional comparative law and cultural analysis, and even 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 potential co-inventors and co-authors from collaborative endeavors, and that such dissuasion cannot be defended on either efficiency or equitable grounds. This deterrence may not have been too detrimental historically, but it is highly problematic today because such 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 paid remarkably little attention to modern research on how to actually promote creativity. This article concludes with proposals for improving the function of joint creator law based upon interdisciplinary creativity research. The proposals include reducing the disparities between joint author and joint inventor doctrine, equitable apportionment of joint creator rights, and establishing a substantive standard for joint creator rights based on providing a non-market contribution to a creative endeavor.

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 forms of intellectual property rights.³ A more rigorous analysis, however, reveals that these common explanations are both underdetermined and historically inaccurate.

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

¹ U.S. CONST. art. I, § 8, cl. 8.

² An Act to promote the progress of useful Arts, 1 Stat. 109 (Apr. 10, 1790); An Act for the encouragement of learning, by securing the copies of maps, charts, and books, to authors and proprietors of such copies, during the times therein mentioned, 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 in the School of Patent*, 58 U. CHI. L. REV. 119 (1991) (discussing these and other reasons as the bases for differences between patent and copyright doctrine).

some similarity.⁴ As with much of patent and copyright, this is not the case for joint creator laws.

The differences between joint inventor and joint author law have been previously noted, but rarely analyzed.⁵ Where the differences are analyzed, the common explanation is the conventional account of intellectual property—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. Though picking and choosing certain aspects of the common 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.

Joint inventor and joint author law both developed in common law, later codified in each case. Somewhat strikingly, the common law development of the doctrines was separated by a century in the United States. Neither development evidences the common explanatory model of intellectual property development. In fact, the judicial opinions in which joint inventor and joint author law develop display remarkably little attention to any underlying objectives of the patent or copyright systems at all. Rather, the decisions primarily involve relatively ad hoc and superficial equitable analyses concerning the isolated work 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 the thesis of this article for two reasons. First, it indicates that lawmakers were not relying on any of the traditionally 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.

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.”⁷

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. For example, Samuel Morse consulted with a number of other scientists worldwide before inventing the telegraph.⁸ When Morse’s rights to certain

⁴ See, e.g., Wiley, *supra* note 3, at 119, 181.

⁵ *Id.* (noting dearth of analysis).

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

⁷ *Stearns v. Barrett*, 22 F. Cas. 1175, 1181 (C.C.D. Mass. 1816) (No. 13,337).

⁸ *O’Reilly v. Morse*, 56 U.S. 62, 69-72 (1853).

telegraph patents were challenged on these grounds, the Supreme Court held that providing general information and advice to Morse did not turn his contacts into joint inventors: “it can make no difference . . . whether [Morse] derives his information from books, or from conversation with men skilled in 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.”⁹

Agawam Wollen Co. v. Jordan, a second Supreme Court case from the mid-1800s, 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.¹⁰ 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.¹¹ On this basis, the Court concluded that “it is a great error to regard [the employees’ contribution] as the invention described in the subsequent patent, or as such material part of the same.”¹²

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 patent law.”¹³ The positive contours of joint inventorship remained relatively unelaborated into the twentieth century.

Patent Act amendments in 1952 that established explicit authority for co-inventors to apply for a patent jointly began to clarify joint inventor law.¹⁴ Though codified for the first time, the right to apply for a patent jointly had been considered implied since the first Patent Act of 1790, in part based on the use of the statutory language “person or persons” to describe inventors.¹⁵ Though the 1952 amendments formally provided for the possibility of joint inventors, they did not define or provide standards for achieving joint inventor status.¹⁶

After the 1952 amendments, courts continued to define joint inventorship primarily in the negative. 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.¹⁷ Then, in a 1967 case concerning a

⁹ *Id.* at 111.

¹⁰ 74 U.S. 583, 588 (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).

¹¹ *Agawam Wollen v. Jordan*, 74 U.S. at 587.

¹² *Id.*

¹³ *Mueller Brass Co. v. Reading Industries*, 352 F. Supp. 1357, 1372 (E.D. Pa. 1972), *aff’d* 487 F.2d 1395 (3d Cir. 1973).

¹⁴ Act of July 19, 1952, ch. 950, 66 Stat. 799 (codified at 35 U.S.C. § 116 (2006)).

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

¹⁶ 35 U.S.C. § 116 (2006).

¹⁷ *Mueller Brass v. Reading Industries*, 352 F. Supp. at 1373-74; *Garrett Corp. v. United States*, 422 F.2d 874, 881 (Cl. Ct. 1970); *Land v. Dreyer*, 155 F.2d 383 (C.C.P.A. 1946).

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.¹⁸

Somewhat remarkably, Judge Holtzoff's analysis is developed in a lengthy paragraph devoid of direct citation. Following his analysis, he references a "pertinent discussion" of joint inventorship law in a case from the early 1900s.¹⁹ Neither Judge Holtzoff nor the earlier decisions relied on any considered analysis of the incentive or creativity goals of patent law. Rather, all appear based primarily on relatively ad hoc reactions to the facts in the particular cases.

Just as positive law concerning the contribution necessary to merit joint inventorship was beginning to take form, new complications cropped up. 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 one or a few claims was a joint inventor in the entire patent.²⁰ Some courts applied a so-called "all-claims" rule, holding that a collaborator had to contribute to every claim in order to be entitled to joint inventorship.²¹ The all-claims rule created significant complexity concerning how to apply for patent rights where multiple inventors developed a technology, but some did not contribute to every claim. This problem was a growing concern due to the rise in team research during the 1960s and 1970s. 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.²²

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 states in section 116, "Inventors may apply for a patent jointly even though (1) they did not physically work together at the same time, (2) each did not make the same type or amount of contribution, or (3) each did not make a contribution to the subject matter of every claim of the patent."²³

¹⁸ *Monsanto Co. v. Kamp*, 269 F. Supp. 818, 824 (D. D.C. 1967).

¹⁹ *Id.*; *Wm. R. Thropp & Sons Co. v. De Laski & Thropp C. W. T. Co.*, 226 F. 941, 949 (3d Cir. 1915); *De Laski & Thropp C. W. T. Co. v. Wm. R. Thropp & Sons Co.*, 218 F. 458, 464 (D. N.J. 1914).

²⁰ 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. The average patent contains about 15 claims.

²¹ *See, e.g., Rival Mfg. Co. v. Dazey Prod. Co.*, 358 F. Supp. 91, 101 (W.D. Mo. 1973); *In re Sarett*, 327 F.2d 1005, 1010 n.7 (C.C.P.A. 1964).

²² *See, e.g., 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 (E.D. Va. 1978); *see Ethicon v. U.S. Surgical*, 135 F.3d 1456, 1469 (Fed. Cir. 1998) (discussing problems with all-claims rule prior to 1984 amendments).

²³ 35 U.S.C. § 116.

The 1984 amendments were an explicit attempt to codify, in general, the existing common law of joint inventorship.²⁴ The first two elements of the section 116 amendments were drawn from Judge Holtzoff's 1967 decision. The third element was derived from Congress' express intent to adopt the non-all-claims rule.²⁵

Pertinent to the discussion here, the non-all-claims rule was selected to promote team research.²⁶ This explicit functional objective stands in stark contrast to the routine reliance on individual fairness-based decisions in most of the development of joint inventor law. Ironically, in *Ethicon v. U.S. Surgical Corporation*, the leading case interpreting the non-all-claims rule, the court appeared to revert to an ad hoc equitable analysis again.²⁷ In *Ethicon*, Yoon was a medical doctor and inventor of numerous patented devices. 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.²⁸ The Federal Circuit held that Choi had contributed to the conception of two of the claims of Yoon's patent at issue, and that this contribution entitled Choi to an equal, undivided interest in the entire patent.²⁹ Judge Newman argued in dissent that section 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.³⁰ Joint inventorship need not mandate equal ownership. The *Ethicon* majority, however, ignored this possibility, and awarded an undivided one-half interest to Choi, even though Choi contributed to the conception of only two out of dozens of claims, neither of which was even at issue in the underlying infringement litigation.³¹ The majority's rationale provided in the opinion is based more on general equity as between the parties, rather than a desire to promote any patent law objectives, a conclusion that is underscored by the majority's criticism of Yoon's attempts to alter evidence and his inconsistent testimony.³² Yoon's behavior in these regards, though unethical, is not relevant to joint inventor doctrine.

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 tell who is. This may have been an intentional effort to avoid rigid requirements that might disqualify worthy individuals,³³ but such a desire does not obviate the need for doctrine defining how or when someone achieves joint inventorship.

²⁴ Section-by-Section Analysis of H.R. 6286, Pat. Law Amendments Act of 1984, 130 CONG. REC. 28069, 28071 (1984)

²⁵ *Id.*; Section-by-Section Analysis: Patent Law Amendments of 1984, 130 CONG. REC. 10525, reprinted in 1984 U.S.C.C.A.N. 5827, 5834.

²⁶ Section-by-Section Analysis of H.R. 6286, *supra* note 24. 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.*

²⁷ 135 F.3d at 1456.

²⁸ *Id.* at 1459.

²⁹ *Id.* at 1461-64.

³⁰ *Id.* at 1468-72.

³¹ *Id.* at 1465-66.

³² *Id.* at 1462.

³³ Section-by-Section Analysis, *supra* note 24.

Since at least Aristotle it has been recognized that something cannot be defined only by describing what it is not.³⁴

Federal Circuit case law now defines joint inventorship. Current doctrine provides 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.³⁵

The latter two elements derive from the nineteenth century Supreme Court decisions discussed above. The first element finally clarifies the substantive standard that a joint inventor must supply, requiring a contribution to the inventive aspect, or “conception,” of the invention.³⁶

The understanding 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.”³⁷ 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.³⁸

A collaborator who satisfies the contribution standard is a joint inventor, and therefore also a joint owner of the patent. Joint owners are treated as tenants in common, each holding an equal, undivided interest in the entire patent.³⁹ This provides each owner, independent rights to make, use, and sell the patented invention.⁴⁰ Such owners can assign their rights to others without permission from their co-owners.⁴¹ Consequently, a joint owner cannot grant an exclusive license without the agreement of

³⁴ SIMON WINCHESTER, *THE MEANING OF EVERYTHING: THE STORY OF THE OXFORD ENGLISH DICTIONARY* 116-17 (2004).

³⁵ *Pannu v. Iolab Corp.*, 155 F.3d 1344, 1351 (Fed. Cir. 1998); see *Ethicon v. U.S. Surgical*, 135 F.3d at 1460.

³⁶ The first use of the phrase “contribution to the conception” appears to be in *Mueller Brass v. Reading Industries*, 352 F. Supp. at 1372. 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).

³⁷ *Trovan, Ltd. v. Sokymat SA, Irori*, 299 F.3d 1292, 1303 (Fed. Cir. 2002).

³⁸ *Yeda Research & Development Co. v. Imclone Systems Inc.*, 443 F. Supp. 2d 570, 621-22 (S.D.N.Y. 2006); *Oka v. Youssefeyeh*, 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”). 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 41, 416-171 (Fed. Cir. 1994) (holding reduction to practice can never suffice) with *Pannu v. Iolab*, 155 F.3d at 1351 (holding that reduction to practice can suffice).

³⁹ 35 U.S.C. § 116.

⁴⁰ 35 U.S.C. § 262.

⁴¹ Robert Merges & Lawrence Locke, *Co-Ownership of Patents: A Comparative and Economic View*, 72 J. PAT. & TRADEMARK OFF. SOC’Y 586, 588 (1990).

all co-owners. Joint patent owners need not account to each other for profits made from exploiting or licensing the patent.⁴² Patent infringement lawsuits can only be brought by all patent co-owners unanimously.⁴³ 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.⁴⁴ 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.⁴⁵ 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 discussion of the evolution of joint inventor law is somewhat extended to demonstrate a couple points. First, the development of joint inventor doctrine, from the common law of the nineteenth century through the codification and further doctrinal development of the twentieth, almost never indicates being guided or mandated by the underlying subject matter of patent law. Similarly, the development generally does not indicate that it depends on patent law’s nonobviousness creativity threshold, the substantive rights of a patent, or any other differences from copyright doctrine. Such dependence, however, could be hard to ascertain in isolation. The following section turns to 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.⁴⁶ 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 hold separate copyrights in their contributions, from a joint work, in which coauthors share rights in the entire work.⁴⁷

American joint authorship law traces its origin to an 1871 English case, *Levy v. Rutley*.⁴⁸ In *Levy*, Wilks had written a play and Levy had contributed one scene and made various other alterations.⁴⁹ 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.”⁵⁰ Another Justice agreed, “there is nothing to show any common design between Wilks and [Levy].”⁵¹ 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,

⁴² 35 U.S.C. § 262.

⁴³ *Willingham v. Lawton*, 555 F.2d 1340, 1344 (6th Cir. 1977); see *Ethicon v. U.S. Surgical*, 135 F.3d at 1468.

⁴⁴ *Willingham v. Lawton*, 555 F.2d at 1344.

⁴⁵ *Ethicon v. U.S. Surgical*, 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).

⁴⁶ Copyright Act of 1790, 1 Stat. 124 § 1 (1790).

⁴⁷ 1-5 NIMMER ON COPYRIGHT § 5.02.

⁴⁸ *Levy v. Rutley*, 6 L.R.-C.P. 523 (1871).

⁴⁹ *Id.*

⁵⁰ *Id.* at 525.

⁵¹ *Id.* at 529.

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.⁵²

Somewhat surprisingly, the first reported American joint author case is a 1915 opinion authored by Judge Learned Hand involving a dispute over opera rights. Conveniently for those conducting legal research in this area, Judge Hand explicitly states that the only prior reported case on joint authorship appears to be *Levy v. Rutley*.⁵³ 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.”⁵⁴ Judge Hand did not evaluate the merits of the 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 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.”⁵⁵ Consistent with dicta from *Levy*, the Circuit also held that joint authorship does not require each author to contribute equally.

Judge Hand had a seemingly rare opportunity to uphold his district court-developed intent requirement three decades later when writing for the Second Circuit in *Edward B. Marks Music v. Jerry Vogel Music*.⁵⁶ *Marks* concerned a plaintiff who had written the lyrics for a song and sold it to a publisher. The publisher hired another individual to write music for the song, without the knowledge of the original lyrics’ author.⁵⁷ 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.⁵⁸

Statutory joint author law was first enacted in the Copyright Act of 1976, with the explicit intent of codifying the existing common law.⁵⁹ 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.”⁶⁰ The Committee Report on the 1976 Act explained,

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

⁵² *Id.* at 525-29.

⁵³ *Maurel v. Smith*, 220 F. 195, 199 (D.C.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 caselaw on joint authorship. WALTER ARTHUR COPINGER, *THE LAW OF COPYRIGHT*, IN *WORKS OF LITERATURE AND ART* 109-10 (4th ed. 1904).

⁵⁴ *Maurel v. Smith*, 220 F. at 199.

⁵⁵ *Maurel v. Smith*, 271 F. 211, 215 (2d Cir. 1921).

⁵⁶ 140 F.2d 266 (1944).

⁵⁷ *Id.*

⁵⁸ *Id.* at 267.

⁵⁹ H.R. Rep. No. 94-1476, at 120-21 (1976).

⁶⁰ 17 U.S.C. § 101.

‘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).⁶¹

As with patent law, the Copyright Act does not define what a joint author is; it only defines a “joint work.” In particular, the Act does not identify what level of contribution is necessary nor what type of intent is required in order to achieve joint authorship.⁶² Defining a joint work as a work prepared by authors “with the intention that their contributions be merged into . . . a unitary whole” appears only to require that the authors intend their work to be merged, but not to require intent to be “joint authors” in the sense of having co-equal interests in the ensuing copyright. Courts, however, have interpreted the language to require intent to be joint authors in the latter sense.⁶³ The reasoning provided for this extension is straightforward: creating 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.”⁶⁴ 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.⁶⁵ Faced with relatively unambiguous statutory language, courts relied on their sense of equity to protect the primary producers of artistic works. Over a century after *Levy*, the intent standard continues to evolve based on a desire to protect the dominant author’s rights against incursion by a secondary contributor.

Relying on equitable perceptions to strengthen the intent standard to protect primary authors may seem unsurprising. If it is unsurprising, however, one must explain why such a 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

⁶¹ H.R. Rep. No. 94-1476, at 120 (1976).

⁶² Roberta Kwall, “*Author-Stories: Narrative’s Implications for Moral Rights and Copyright’s Joint Authorship Doctrine*,” 75 S. Cal. L. Rev. 1, 48 (2001).

⁶³ *Aalmuhammed v. Lee*, 202 F.3d 1227 (9th Cir. 2000); *Thompson v. Larson*, 147 F.3d 195, 201-02 (2d Cir. 1998); *Erickson v. Trinity Theatre, Inc.*, 12 F.3d 1061 (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*. 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.

⁶⁴ *Childress v. Taylor*, 945 F.2d at 507.

⁶⁵ *Id.*

that it would be unfair to deny joint inventorship where 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 decision on a lack of intent. In each case the lead inventor clearly did not intend for the other contributors to be joint inventors. Instead of relying on such straight-forward analysis, however, the Court delved into the actual technological contributions of the putative joint inventors, getting into rather specific technical detail in order to determine that the contributions were not technologically substantial enough to satisfy the joint inventor standard.

The disparate view of who is entitled to intellectual property rights in technological versus artistic endeavors is highlighted by the example of the research assistant used in *Childress*. The court reasoned that even though a research assistant may contribute copyrightable material to the work of a lead author, and there is intent to produce a joint work, the parties do not intend the research assistant to be a joint author.⁶⁶ 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 *Ethicon*.⁶⁷ 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.⁶⁸

In addition to ambiguity concerning the intent requirement, the 1976 Copyright Act also did not identify whether a contribution had to be independently copyrightable in order to render the contributor a joint author.⁶⁹ 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.⁷⁰

Childress is again the leading case. The court referred to requiring independent copyrightability as “troublesome” before noting that, “If the focus is solely on the objectives 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.”⁷¹ Contrary to the “objectives of copyright law,” however, the court instead adopted an independent copyrightability requirement for two reasons: to potentially dissuade spurious claims of joint authorship and to strike a balance between copyright and contract, as in the absence of a contract the copyright will remain with the person who created the copyrightable material.⁷²

At first glance, the reasoning in *Childress* may appear to partially contradict the thrust of this article, as the court at least considers the goals of the copyright system.

⁶⁶ *Id.*

⁶⁷ 135 F.3d at 1456.

⁶⁸ *Id.* at 1468.

⁶⁹ Kwall, *supra* note 62, at 48.

⁷⁰ 1 COPYRIGHT: PRINCIPLES, LAW AND PRACTICE § 4.2.1.2 (1989); 1 NIMMER ON COPYRIGHT § 6.07 (1991).

⁷¹ *Childress v. Taylor*, 945 F.2d at 506.

⁷² *Id.* at 507.

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.⁷³ The second reason proffered is explicitly based on an ad hoc reaction about fairness—why the default rule should exclude a secondary contributor is not explored.

Following *Childress*, a number of other circuit and district courts considered the question of independent copyrightability. Every one followed *Childress*' lead, generally without reconsidering the analysis.⁷⁴ Where the courts did engage in independent analysis, it was again relatively superficial and equitable.⁷⁵

The *Childress* decision thus develops two requirements (independent copyrightability and intent to be joint authors) that are not mandated by the Copyright Act,⁷⁶ which combined result in doctrine that strongly favors the award of copyright to sole (and primary) authors rather than including joint (and secondary) authors. The court reaches this 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.

As with joint inventors under patent law, joint authors are treated as tenants in common, each co-owner having an equal, undivided right to use and license the copyrighted work.⁷⁷ This gives each owner the rights to copy, distribute, prepare derivative works, grant non-exclusive licenses, and exercise other rights in the work.⁷⁸ Unlike patent law, joint copyright owners can independently commence actions for infringement against third parties without joining the other co-owners.⁷⁹

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.⁸⁰ This requirement is not mandated in statute, but by common law based on “equitable doctrines relating to unjust

⁷³ *Childress v. Taylor*, 945 F.2d at 507. The standard for originality is so low that it is hard to imagine how the independent copyrightability standard could block many spurious claims. See, e.g., *Feist Publications, 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.”)

⁷⁴ *Aalmuhammed v. Lee*, 202 F.3d at 1227; *Erickson v. Trinity Theatre*, 12 F.3d at 1071; *M.G.B. Homes, Inc. v. Am. Homes, Inc.*, 903 F.2d 1486, 1493 (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 *Community 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 *M. Nimmer & D. Nimmer, NIMMER ON COPYRIGHT § 6.03*, at 6-6 and § 6.17, at 6-18 (1985)); *Neva, Inc. v. Christian Duplications, Int'l, Inc.*, 743 F. Supp 1533 (M.D. Fla. 1990) (requiring only de minimis contribution (and intent) in order to be joint author).

⁷⁵ See, e.g., *Clogston v. Am. Acad. Orthopedic Surgeons*, 930 F. Supp. 1156, 1159 (D. Tex. 1991) (asserting that the *Childress* rule “strikes the proper balance between the rights of contributors and the rights of authors”).

⁷⁶ *Childress v. Taylor*, 945 F.2d at 506-07 (recognizing that decision is not mandated by language of Copyright Act).

⁷⁷ 17 U.S.C. § 201(a).

⁷⁸ Gary Moore, *Joint Ventures and Strategic Alliances: Ownership of Developed Intellectual Property—Issues and Approaches*, in *HANDLING INTELLECTUAL PROPERTY ISSUES IN BUSINESS TRANSACTIONS* 216 (2007).

⁷⁹ 17 U.S.C. § 501(b).

⁸⁰ *Richlin v. Metro-Goldwyn-Mayer Pictures, Inc.*, 531 F.3d 962, 967 (9th Cir. 2008); *Thomson*, 147 F.3d at 195.

enrichment and general principles of law governing the rights of co-owners.”⁸¹ Such reasoning would seem to apply equally to 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.⁸²

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, in this regard, even though joint author law arose long after joint inventor law, there is no indication during its development that those playing a role in joint author doctrine ever paid significant attention to joint inventor law, either as a base to emulate or to evade. Similarly, there is nothing in the over a century 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.⁸³ 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.⁸⁴ None of these differences appear able to explain the variance 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.⁸⁵

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. 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. This conclusion is further strengthened by analyzing whether the law could have evolved differently.

C. *Examining Alternate Worlds*

Doubters of this article’s thesis may be skeptical that joint author and joint inventor doctrine are so malleable, in some sense, that stereotypes of creativity could

⁸¹ *Goodman v. Lee*, 7 F.3d 1007, 1012 (5th Cir. 1996).

⁸² 35 U.S.C. § 262. Congress did expressly acknowledge the judicially created accounting rule for joint authors when adopting the Copyright Act in 1976. H.R. REP. NO. 1476, 94th Cong., 2d Sess. 121 (1976).

⁸³ Wiley, *supra* note 3.

⁸⁴ *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.

⁸⁵ *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 such a source could produce such disparate doctrines).

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 exist 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 application of current joint creator standards in their counterpart areas of law.

1. The Economic Inefficiency of Joint Creator Doctrine

Certain law and economics accounts of the common law predict that legal doctrine will evolve towards efficiency.⁸⁶ Under a basic version of this model, inefficient legal rules create costs for parties, who therefore have incentives to litigate and modify such rules, an incentive that is reduced once more efficient legal rules are established.⁸⁷ If the efficiency hypothesis is correct for joint author and joint inventor law, then this law should involve a set a default rules that provide terms for dividing joint creator rights in a manner that the parties involved would often have tended to agree to anyway.⁸⁸ This, however, is not the case. Both joint inventor and joint author law provide joint creators with equal, undivided interests in the intellectual property produced, regardless of the relative contribution of each party. In the real world, parties rarely contract for equal interests in prospective intellectual property, particularly where contributions are not expected to be equal. For example, employees routinely assign away all rights in prospective inventions in exchange for employment and putative coauthors routinely enter contracts that do not divide rights equally.⁸⁹

Economic analysis of law does provide that, in certain circumstances, efficient law is not that which the parties would have agreed to anyway. Professors Ayres and Gertner famously explained that “penalty” default rules are more efficient in certain contexts, in particular for our purposes where rules should be designed to resolve problems of asymmetrical information among the parties.⁹⁰ In such situations, penalty default rules can be used to efficiently incentivize a more informed party to reveal information to a less informed party.⁹¹

Joint creator laws, however, do not fit the model for penalty default rules either. Under joint author law, it is the dominant author who controls the asymmetrical

⁸⁶ See Ronald Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960) (indicating concept of efficiency in evolution of common law); Isaac Ehrlich & Richard Posner, *An Economic Analysis of Legal Rulemaking*, 3 J. LEGAL STUDIES 257 (1974) (developing efficiency in evolution of common law thesis).

⁸⁷ Richard Posner, *ECONOMIC ANALYSIS OF LAW* 97, 99 (7th ed. 2007).

⁸⁸ *Id.*; Ian Ayres & Robert Gertner, *Filling Gaps in Incomplete Contracts: An Economic Theory of Default Rules*, 99 YALE L.J. 87, 87-90 (1989).

⁸⁹ See, e.g., *Georgia-Pacific Corp. v. Lieberam*, 959 F.2d 901, 904-06 (11th Cir. 1992) (invention agreement contract assigns all ownership rights to employer); Abbott Marie Jones, *Get Ready Cause Here They Come: A Look at Problems on the Horizon for Authorship & 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 the recording company).

⁹⁰ Ayres & Gertner, *supra* note 88, at 97.

⁹¹ *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.*

information (his or her own intent concerning joint authorship), but the 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 there is any information in the hands of such an inventor that the rule is designed to dislodge. Joint creator law thus is not explained by traditional efficiency or economic analysis of the law rationales.

2. Shifting Creativity Standards

A seldom noted twist in patent and copyright law development provides further evidence that the different joint inventor and joint author standards do not result from differing creativity thresholds. The creativity requirements in patent and copyright have, to an extent, inverted over time.

When the Patent Act was first enacted in 1790, it contained only two substantive standards for patentability: utility and novelty.⁹² There was no nonobviousness requirement. In 1851 the Supreme Court in *Hotchkiss v. Greenwood* established the precursor to the current statutory nonobviousness standard.⁹³ 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 [a] inventor.”⁹⁴ This new “invention” requirement raised the creativity standard for patentability, and would evolve into the current nonobviousness standard, as codified in 1952.⁹⁵

Conversely to patent law, copyright law had a higher creativity threshold in its early days than it does now. In *Jollie v. Jacque*, 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.⁹⁶ The court juxtaposed the standard for originality for a copyright against what “a mere mechanic in music” could achieve.⁹⁷ 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.”⁹⁸

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

⁹² Act of Apr. 10, 1790, ch. 7, § 1, 1 Stat. 109, 110 (1790). 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 27.

⁹³ 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).

⁹⁴ *Hotchkiss v. Greenwood*, 52 U.S. 248, 267 (1851).

⁹⁵ 35 U.S.C. § 103(a).

⁹⁶ 13 F.Cas. 910 (C.C.S.D.N.Y. 1850).

⁹⁷ *Id.* at 913.

⁹⁸ *Id.* at 913-14.

ordinarily skilled artisan in the pertinent field.⁹⁹ Patent law raised its standard from an earlier novelty threshold to reach this requirement, a shift that copyright law would follow in reverse in subsequent years.

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

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

To evaluate whether joint creator law results from differences between the patent and copyright systems, one also can consider whether there are viable alternatives to current joint creator doctrine. It is relatively evident that either system could function with (or without) an intent requirement.¹⁰⁰ 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 individuals 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.

The absence of an "independent patentability" requirement does not appear mandated by any of these scenarios. Under the first, whether the independent patentability rule exists or not is 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."¹⁰¹ Under this scenario the contributions only involve improvements that are obvious to persons of ordinary skill. Multiple contributions, each obvious to persons of ordinary skill, cannot produce a collective result that is nonobvious. If each contribution is obvious, but it is their combination that is nonobvious, then whoever conceived of the

⁹⁹ See Joseph Miller, *Hoisting Originality* 18-19, 28-29 (discussing similarity of patent and copyright standards in *Hotchkiss* and *Jacques*).

¹⁰⁰ 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 *supra* part III.

¹⁰¹ 35 U.S.C. § 103(a).

combination made the nonobvious contribution.¹⁰² Though this account of invention is 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 does.

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, Judge Newman argued for such a result in her dissent in *Ethicon*.¹⁰³ Judge Newman interpreted the 1984 amendments to section 116 to apply only to joint inventorship, not joint ownership.¹⁰⁴ In Judge Newman's view, section 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.¹⁰⁵ 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 be more akin to 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 argued for years.¹⁰⁶ So too, as criticism of *Childress* and its progeny reveals, copyright law need not require intent to be coauthors.¹⁰⁷ Rather than current doctrine, copyright law could require only a "not insignificant" contribution, which was not available in the public domain, to an original aspect of the 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 again indicates that the doctrinal differences in joint creator law do not derive from the commonly attributed sources.

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,¹⁰⁸ other countries' joint creator doctrines differ significantly from the United States'. In particular, foreign joint author and inventor law is often more internally harmonious, indicating that the American divergence is not necessary.

¹⁰² See *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398 (2007) (discussing when insight to combine various prior art references is nonobvious).

¹⁰³ *Ethicon v. U.S. Surgical*, 135 F.3d at 1468 (Newman, J., dissenting).

¹⁰⁴ *Id.* at 1470.

¹⁰⁵ *Id.*

¹⁰⁶ 1 NIMMER ON COPYRIGHT § 6.07 (1991).

¹⁰⁷ See, e.g. Kwall, *supra* note 62; Rochelle Dreyfuss, *Collaborative Research: Conflicts on Authorship, Ownership, and Accountability*, 53 VAND. L. REV. 1161 (2000).

¹⁰⁸ See, e.g., INTERNATIONAL COPYRIGHT AND PRACTICE (Melville Nimmer & Paul Geller eds. 2007) (detailing similarities in copyright law throughout the world); Gregory Mandel, *Regulating Nanotechnology through Intellectual Property Rights*, in INTERNATIONAL HANDBOOK ON REGULATING NANOTECHNOLOGIES (Graeme Hodge et al. eds, forthcoming 2010) (discussing similarities in patent validity requirements throughout the world).

The greatest discrepancy between American and foreign joint creator laws is that almost no other country follows the American intent standard for joint authorship. Most countries have no intent requirement for joint authorship at all. Rather, joint authorship is usually defined functionally: where the contributions of multiple authors cannot be separated out, then the contributors are joint authors, regardless of intent.¹⁰⁹ Canada is perhaps the only other country with an intent requirement similar to the United States.¹¹⁰

There is also variation in the independent copyrightability requirement of joint authorship. Britain, for example, requires a “significant and original contribution,” a contribution that need not rise to the level of independent copyrightability.¹¹¹ Japanese law provides for joint authorship where “the contribution of each person cannot be separately exploited,” again regardless of independent copyrightability.¹¹² The German copyright act applies the same requirement.¹¹³ China has an analogous rule, providing that the ability to separately exploit a work entitles each author to a separate copyright in their contribution, but not if exercising such separate rights would “prejudice the copyright in the joint work as a whole.”¹¹⁴

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 the United States. In Australia, a person is entitled to joint inventorship if his or her contribution “had a material effect on the final concept of the invention.”¹¹⁵ “Material effect” can be satisfied by: (1) solving a problem not recognized by the inventor, (2) solving a recognized problem that the inventor could not, or (3) producing an advantage not contemplated by the primary inventor.¹¹⁶ South Korea includes not just those who contributed to the conception of an invention as joint inventors, but also those who contributed to “activities that led to [the] conception.”¹¹⁷ 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.¹¹⁸ It appears, for example, that the employees in *Agawam Woolen* would likely have been joint inventors in Australia and South Korea, contrary to their exclusion from joint inventorship in the United States.

¹⁰⁹ See, e.g., COPYRIGHT ACT, art. 2(1)(xii) (Japan); S. Ramaiah, *India*, in INTERNATIONAL COPYRIGHT AND PRACTICE § IND 4(1)(a) (Melville Nimmer & Paul Geller eds. 2007); JAMES & WELLS INTELLECTUAL PROPERTY LAW IN NEW ZEALAND 194 (2007).

¹¹⁰ Neudorf v. Netzwerk Productions Ltd., B.C.J. 2831 (Can. 1999).

¹¹¹ Lionel Bentley & William Cornish, *United Kingdom*, in INTERNATIONAL COPYRIGHT AND PRACTICE § IND 4(1)(a) (Melville Nimmer & Paul Geller eds. 2007); PASCAL KAMINA, FILM COPYRIGHT IN THE EUROPEAN UNION 143-44 (2002).

¹¹² COPYRIGHT ACT, art. 2(1)(xii) (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).

¹¹³ Urheberrechtsgesetz, art. 8(1) (Germany).

¹¹⁴ Copyright Law of People’s Republic of China, art. 13.

¹¹⁵ Row Weeden Pty. V. Nielsen, 39 I.P.R. 400 (Aus. 1998).

¹¹⁶ *Id.*

¹¹⁷ Kevin Lee & Tae Jun Suh, *Korea: A Question of Ownership*, ASIA PACIFIC IP FOCUS 2007 SUPPLEMENT TO MANAGING INTELLECTUAL PROPERTY (2007).

¹¹⁸ Korean Intellectual Property Office, THE SYSTEM FOR COMPENSATION FOR AN EMPLOYEE’S INVENTION (2004).

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.¹¹⁹ 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.¹²⁰

In addition to variance in the 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 coauthors. Switzerland and South Africa provide a striking difference, requiring unanimous consent among joint inventors to exploit a patented invention.¹²¹ 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).¹²² Some European countries and Japan prohibit patent co-owners from transferring their ownership rights without unanimous consent of the other co-owners.¹²³ 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.¹²⁴ A few countries, including France and Germany, require joint owners to account to each other for profits received from exploiting a patent individually.¹²⁵ Many foreign jurisdictions permit co-owners to enforce their patent rights independently, unlike the United States.¹²⁶

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.¹²⁷ Similarly, and again unlike the United States, in most foreign jurisdictions joint authors may not independently license their copyright to third parties, but must achieve unanimous consent to do so.¹²⁸ Brazil takes an in-between approach, permitting a

¹¹⁹ Yoshifuji & Kumagai, TOKKYO HOU GAISETSU (OVERVIEW OF PATENT LAW) 187-89 (rev. 13th ed. 1998).

¹²⁰ Yeda Res. & Dev. Co. Ltd. v. Rhone-Poulenc Rorer Int’l Hold. Inc., UKHL 43 (Eng. 2007); Apotex Inc. v. Wellcome Foundation Ltd., 4 S.C.R. 153 (Can. 2002).

¹²¹ See South Africa Patents Act No. 57 of 1978 s. 49(2) (as amended by No. 58 of 2002); AIPPI, Committee No. Q194: The Impact of Co-Ownership of Intellectual Property Rights on their Exploitation, *Switzerland*, at 4, available at <https://www.aippi.org/download/comitees/194/GR194switzerland.pdf>.

¹²² Moore, *supra* note 78, at 213; see, e.g., Patent Act, Act No. 121 of 1959, Art. 73(3) (Jap.); JAMES & WELLS, *supra* note 115, at 33-34.

¹²³ Merges & Locke, *supra* note 41, at 590.

¹²⁴ AIPPI, Committee No. Q194: The Impact of Co-Ownership of Intellectual Property Rights on their Exploitation, *China*, at 3, 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, *Brazil*, at 3, available at <https://www.aippi.org/download/comitees/194/GR194brazil.pdf> (citing the Civil Code of Brazil art.).

¹²⁵ Merges & Locke, *supra* note 41, at 590.

¹²⁶ E.g. AIPPI *Brazil*, *supra* note 130, at 3; AIPPI, Committee No. Q194: The Impact of Co-Ownership of Intellectual Property Rights on their Exploitation, *Denmark*, available at <https://www.aippi.org/download/comitees/194/GR194denmark.pdf>.

¹²⁷ See, e.g., David Marchese, *Joint Ownership of Intellectual Property*, 21 EUR. INTEL. PROP. REV. 364, 367 (1999); Law on the Protection of Intellectual Property Rights, No. 82, 2002, art. 174 (Egypt) (if it is “impossible to distinguish the contribution of each in the joint work”); AIPPI, Committee No. Q194: The Impact of Co-Ownership of Intellectual Property Rights on their Exploitation, *Japan*, at 3, available at <https://www.aippi.org/download/comitees/194/GR194japan.pdf>.

¹²⁸ Moore, *supra* note 78, at 218.

majority of joint authors to decide how to exploit a work.¹²⁹ Most other jurisdictions require unanimous consent in order for a joint author to transfer his or her ownership interest.¹³⁰

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 variance exists despite an overall uniformity in the underlying patent and copyright systems.¹³¹ Such variance provides further evidence that current scholarly attempts to explain the differences in American joint creator law based on differences between copyright and patent are unsuccessful. In combination, the historical, textual, conceptual, and comparative analyses presented here provide a wealth of data to support this conclusion. The commonly accepted 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 doctrine, history, and other facts is that the differences arose, at least in part, as a result of common biases in differing sociocultural perceptions of the creativity and processes that produce technological innovation versus artistic expression. Whether law-makers 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.

This is not to claim that stereotypes of creativity are the sole cause of the myriad differences between copyright and patent law. Doctrines that have been developed over centuries by numerous actors have multivariate sources. Creativity prejudices do appear, however, to be a significant, and previously unrecognized, cause of many of the differences. Simply put, such prejudices better explain the particular divergence between certain patent and copyright doctrine than 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 sciences, and these particular inaccuracies can have detrimental effects on the opportunity for intellectual property law to promote creativity.

This section begins with a discussion of common stereotypes concerning artistic and inventive creativity, and common stereotypes concerning the association between artists or inventors and their works. The hypothesis that such stereotypes have influenced the law is based on four lines of evidence, which are elaborated in the second section of this part: first, that stereotypes of creativity map remarkably consistently onto differences between joint inventor and joint author doctrine; second, that the text of judicial opinions

¹²⁹ Manoel Pereira do Santos & Otto Licks, *Brazil*, in INTERNATIONAL COPYRIGHT AND PRACTICE § BRA 4(1)(a)(i) (Melville Nimmer & Paul Geller eds. 2007).

¹³⁰ See, e.g. AIPPI, Committee No. Q194: The Impact of Co-Ownership of Intellectual Property Rights on their Exploitation, *Canada*, at 3, 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.

¹³¹ 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 *supra* part II.A.2.

reveal the influences of these stereotypes; third, that a comparative law and culture analysis is consistent with stereotype-driven doctrine; and fourth, that the temporal evolution of differing conceptions of creativity matches the evolution of joint creator legal doctrine.

A. *Stereotypes of Inventive and Artistic Creativity*

Social stereotypes concerning artistic versus inventive creativity have now been well studied. Similarly, differences in stereotypes concerning the association between artists versus inventors and their respective works have also been elaborated.

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 it was discovered that similar injury to opposite sides of the brain impairs function differently.¹³² Beliefs concerning left-brain/right-brain hemispheric differentiation increased 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.¹³³ The cerebral cortex is divided into two hemispheres, the left and the right. These hemispheres have many overlapping functions, but also display some asymmetries.¹³⁴ The left side of the brain is more dominant for language activities; the right more dominant for visuospatial function, from object perception to dance.¹³⁵ An 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 about a wide variety of differences between the roles of the left-brain versus the right-brain, many concerning creative function, but often based on little evidence.¹³⁶ 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.¹³⁷ This differentiation analysis grew rampant. One author collected twenty different commonly used dichotomous labels ascribing different types of creative function to each hemisphere.¹³⁸ The differentiation worked its way into popular culture, leading to a general social perception of creativity differences between

¹³² SALLY SPRINGER & GEORG DEUTSCH, *LEFT BRAIN, RIGHT BRAIN* 13-14 (1985); JOHN DACEY & KATHLEEN LENNON, *UNDERSTANDING CREATIVITY: THE INTERPLAY OF BIOLOGICAL, PSYCHOLOGICAL, AND SOCIAL FACTORS* 205 (1998).

¹³³ *Id.* at 202.

¹³⁴ *Id.* at 203-05.

¹³⁵ *Id.*; Philip Vernon, *Intelligence, Cognitive Styles, and Brain Lateralization*, 19 *INTER. J. PSYCHOL.* 435, 440 (1984); JAMES IACCINO, *LEFT BRAIN-RIGHT BRAIN DIFFERENCES: INQUIRIES, EVIDENCE, AND NEW APPROACHES* 7-10 (1993). There may also be chemical differences between the hemispheres that produce cognitive, emotional, and behavioral asymmetries. DACEY & LENNON, *supra* note 132, at 203-05.

¹³⁶ *Id.* at 203; R.M. RESTAK, *THE BRAIN HAS A MIND OF ITS OWN* 37-38 (1991).

¹³⁷ DACEY & LENNON, *supra* note 132, at 204.

¹³⁸ *Id.*; *see also* SPRINGER & DEUTSCH, *supra* note 132, at 238-39 (discussing the popularization of left-brain/right-brain hemisphere lateralization in the 1970s).

the left and right brain hemispheres, and to the popular conceptions of “left-brain people” versus “right-brain people.”¹³⁹

This hemispheric differentiation was reinforced by the concept of hemispheric dominance. 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.¹⁴⁰ As most people are right-handed (and right-footed and right-eyed), it became commonly believed that most people are left-brain dominant.¹⁴¹

Based on the perceived dichotomy between left-brain and right-brain creativity, artistic and scientific creativity became differentiated as well. Artistic creativity, which was commonly perceived as an intuitive, holistic, subjective process that springs forth from the author’s mind, became associated with right-brain mode of thinking: cognitive processes that are internal, relational, and focused on the whole.¹⁴² Technological innovation, on the other hand, perceived as a much more linear and analytical process that is externally-mandated by technical requirements, aligned closely with conceptual left-brain mode of thinking: cognitive processes that are logical, sequential, and focused on parts rather than the whole.¹⁴³ The left-brain/right-brain dichotomy also worked its way into popular culture.¹⁴⁴

The juxtaposition of left-brain versus right-brain is hardly the only dual-mode theory of cognition. Differentiation in cognitive function has been recognized 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.¹⁴⁵ The latter is more rational, logical, pragmatic, and based in reality.¹⁴⁶ Current cognitive psychologists, on the other hand, often distinguish between System 1 and System 2 reasoning. System 1 is an 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.¹⁴⁷ System 2 is a deliberative,

¹³⁹ See, e.g., IACCINO, *supra* note 135, at 218 (explaining that in the 1970s and 1980s educators and general public became too fixated on concept of teaching to right side of the brain); BETTY EDWARDS, *DRAWING ON THE RIGHT SIDE OF THE BRAIN* (rev. ed. 1989); SPRINGER & DEUTSCH, *supra* note 132, at 239.

¹⁴⁰ DACEY & LENNON, *supra* note 132, at 202-03.

¹⁴¹ *Id.* at 202-05.

¹⁴² DAVID MYERS, *PSYCHOLOGY* 92 (2003); see also Rhawn Joseph, *The Right Cerebral Hemisphere: Emotion, Music, Visual Spatial Skills, Body Image, Dreams, and Awareness*, 44 *J. CLINICAL PSYCHOL.* 630, 637-43 (1988); J.P. Guilford, *Creativity Research: Past, Present, & Future*, in *FRONTIERS OF CREATIVITY RESEARCH* 41 (Scott G. Isaksen, ed., 1987).

¹⁴³ MYERS, *supra* note 142, at 92; ZINA O’LEARY, *THE ESSENTIAL GUIDE TO DOING RESEARCH 2* (2004) (listing stereotypical attributes of researchers and noting their correlation to attributes of left-brained individuals).

¹⁴⁴ See, e.g., 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”); 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).

¹⁴⁵ DEAN KEITH SIMONTON, *ORIGINS OF GENIUS: DARWINIAN PERSPECTIVES ON CREATIVITY* 63 (1999).

¹⁴⁶ *Id.*

¹⁴⁷ Daniel Kahneman, *A Perspective on Judgment and Choice*, 58 *AM. PSYCHOLOGIST* 697, 698-700 (2003).

analytic reasoning system that is slower, serial, and more effortful; it is more consciously controlled and deliberative than System 1.¹⁴⁸ 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 as well.¹⁴⁹

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 a creator and her work. Most people identify a much closer relationship between an author and his work than between an inventor and her invention. 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.¹⁵⁰ 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, which provide certain rights to authors concerning attribution and integrity of a work, regardless of whether the author has transferred the physical work or copyright in it.¹⁵¹ The traditional view is that American (and British) copyright law, which lack moral rights doctrines, are not as bound to romantic notions of authorship because their copyright doctrine arose prior to the rise of the romantic concept of author in the nineteenth century.¹⁵²

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,¹⁵³ commentators have noted that romantic views of authorship still have worked their way into American

¹⁴⁸ *Id.*

¹⁴⁹ Paul Torrance, *Hemisphericity and Creative Functioning*, 15 J. RES. & DEVELOPMENT IN EDUC. 29, 29-30 (1982).

¹⁵⁰ Martha Woodmansee, *The Genius and the Copyright: Economic and Legal Conditions of the Emergence of the ‘Author,’* 17 EIGHTEENTH-CENTURY STUD. 425, 428-430 (1983-1984); IMMANUEL KANT, *ESSAYS AND TREATISES ON MORAL, POLITICAL, AND VARIOUS PHILOSOPHICAL SUBJECTS* (William Richardson ed. and trans., 1798).

¹⁵¹ Catherine Fisk, *Credit Where It’s Due: The Law and Norms of Attribution*, 95 GEO. L.J. 49, 67 (2006); Kwall, *supra* note 62, at 19.

¹⁵² *Id.* at 19-20; Peter Jaszi, *Towards a Theory of Copyright: The Metamorphoses of “Authorship,”* 1991 DUKE L.J. 455; 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 a “200-year-old stereotype” rather than a “timeless truth about Art.”).

¹⁵³ *Fogerty v. Fantasy, Inc.*, 510 U.S. 517, 524 (1994); *Feist Publications*, 499 U.S. at 349; Kwall, *supra* note 62, at 20.

copyright law.¹⁵⁴ This, 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.¹⁵⁵

Romantic notions of authorship are revealed in American perspectives on moral rights doctrine, not when contrasted with Continental perspectives, but when viewed from a perspective that compares American copyright and patent law. Although copyright law generally does not recognize moral rights in authors, it does do so in certain circumstances, and, more importantly, this limitation draws routine and heavy criticism.¹⁵⁶ Patent law similarly lacks any moral rights for inventors, but such rights are almost never seriously advocated.¹⁵⁷

Current societal perceptions provide perhaps the starkest example of the difference between the artist-work and inventor-invention relationships. How many great inventors from the past fifty years can you (the reader) name and link to particular inventions? Most people are hard-pressed to identify more than a handful. Asking someone to name great authors, artists, or songwriters of the past fifty years, on the other hand, easily produces an extensive list.

Why is it that most individuals can make so many associations between authors and their works, but almost none between inventors and their inventions? 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 Macintosh, 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.

¹⁵⁴ ROSEMARY COOMBE, *THE CULTURAL LIFE OF INTELLECTUAL PROPERTIES* 284-84 (1998); JAMES BOYLE, *SHAMANS, SOFTWARE, AND SPLEENS: LAW AND THE CONSTRUCTION OF THE INFORMATION SOCIETY* (1996); Jaszi, *supra* note 152, at 455, 496-500.

¹⁵⁵ *Id.*; see also Fisk, *supra* note 10, at 1160-61 (discussing romantic view of inventor during this same period).

¹⁵⁶ Amy Alder, *Against Moral Rights*, 97 CAL. L. REV. 263 (2009) (noting “largely repetitive law review literature” in which “scholars take it as gospel that moral rights are crucial . . . [and that] . . . we need a more robust moral rights doctrine,” but critiquing this position); Fisk, *supra* note 151; Kwall, *supra* note 62, at 22-26; Edward Damich, *The Right of Personality: A Common-Law Basis for the Protection of the Moral Rights of Authors*, 23 GA. L. REV. 1 (1988). The Visual Artists Rights Act provides limited rights of attribution and integrity in the work to authors. 17 U.S.C. § 106(a).

¹⁵⁷ Dan Burk & Mark 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 on moral right, reward, or distributive justice, they are hard to take seriously as explanations for the actual scope of patent law.”).

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.

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 to be 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. Where 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 intended it.

Inventive creativity, on the other hand, is routinely considered to involve a more linear process and 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 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 to collaborate to produce a joint work, and discussed the ambiguity in the legislative history of the 1976 Copyright Act concerning this distinction.¹⁵⁸ The Circuit 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,”¹⁵⁹ and on this basis established 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.

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

¹⁵⁸ *Childress v. Taylor*, 945 F.2d at 505.

¹⁵⁹ *Id.*

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 obvious.

The court in *Ethicon*, on the other hand, may have been equally blind in the opposite direction. That 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 the primary authors from violation of his or her interest in the works; the *Ethicon* court had no such problems, despite the fact that it was aware that the Patent Act did not dictate such an outcome.¹⁶⁰

Differing rules for accounting to joint owners and commencing infringement suits provide further evidence of the interrelated view of authored works versus the segregated view of invention. As noted, American copyright law permits coauthors to independently exploit a work, but an author who does so must account to the other co-owners.¹⁶¹ 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 equitable reasons.¹⁶² Patent law also requires that a suit for infringement be joined by all co-owners; there is no equivalent requirement in copyright.¹⁶³ To be sure, there are other reasons for this requirement in patent law, as the possibility of a patent being invalidated would strongly prejudice one's co-owners, and is less of a concern in copyright. Other commonly identified purposes for the patent rule, however, such as protecting infringers from multiple lawsuits and protecting licensees from suits by co-owners,¹⁶⁴ 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 coauthors lack. These differences are again 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.¹⁶⁵

¹⁶⁰ See *supra* part I.A-B.

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

¹⁶² 35 U.S.C. § 262; see *Vose v. Singer*, 4 Allen 226 (Mass. 1862).

¹⁶³ *Willingham v. Lawton*, 555 F.2d at 1344; 17 U.S.C. § 501(b),(c); see *Ethicon v. U.S. Surgical*, 135 F.3d at 1468.

¹⁶⁴ *Willingham v. Lawton*, 555 F.2d at 1344.

¹⁶⁵ Kwall, *supra* note 62, at 44-45 ("the Romantic view of authorship seems to pervade the operation of copyright's joint authorship doctrine"); Sibley, *supra* note 85, at 342 ("the cult of the romantic author (much like that of the hero-intentor) runs deep in the history of United States copyright law.").

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 also certainly remain.¹⁶⁶ Americans idolize the achievements of single, iconic inventors, referring, for instance, to “Edison’s light bulb,” “Bell’s telephone,” and “Salk’s polio vaccine.” The common conception of the “Eureka” moment of invention, achieved by a single researcher, remains a classic paradigm.¹⁶⁷ That being said, each of the individuals and inventions just noted 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.¹⁶⁸ No individual is credited with inventing the computer, the cellphone, 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.¹⁶⁹

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 hypothesis that judges view the creativity of authors and inventors differently is also revealed in the language of judicial opinions. Though published opinions rarely reveal a judge’s conception of the creative process, occasional opinions do, and when this occurs the opinions tend to reveal very different perceptions of artistic creativity versus inventive creativity.

The inventive process is routinely described as a search, a conception that almost necessarily entails a logical, process-driven form of creativity.¹⁷⁰ The artistic process, on

¹⁶⁶ Elisabeth Crawford, *Nobel: Always Winners, Never Losers*, 282 *SCIENCE* 1256, 1257 (1998); Sibley, *supra* note 85 at 342.

¹⁶⁷ Kevin Dunbar, *How Scientists Build Models: In Vivo Science as a Window on the Scientific Method*, in *MODEL-BASED REASONING IN SCIENTIFIC DISCOVERY* 96 (Lorenzo Magnani & Paul Thagard eds. 1999); Burk, *supra* note 157, at 1583 (“The prototypical innovation contemplated by the patent law is made by an individual inventor working in his garage after hours.”); Sibley, *supra* note 85, at 330. The image of a person yelling “Eureka!” upon a significant insight is traced to 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 145, at 35.

¹⁶⁸ Fisk, *supra* note 10, at 1141.

¹⁶⁹ See Dreyfuss, *supra* note 107, 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 part III.

¹⁷⁰ See, e.g., *Warner-Lambert Co. v. Teva Pharmaceuticals USA, Inc.*, 418 F.3d 1326, 1330 (Fed. Cir. 2005) (describing invention as a search). A search of the ALLFEDS database for “patent & search w/5 solution” identified 54 cases on February 5, 2010.

the other hand, is never described in these terms¹⁷¹ One court, for example, highlighted its linear, step-by-step perception of invention: “When a claim covers a series of steps of a number of elements in a contribution, the invention may well be joint though some of the steps or some of the elements may have come of the thought of but one.”¹⁷² Another court took the perspective of left-brain style creativity in invention to an extreme, reasoning, “I am not impressed with the defendant's argument that the patent lacks invention because its results were or should have been expected by Dr. Sinden. 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.”¹⁷³ Artistic creativity would never be described as “expected.”

The artistic creative process, in fact, is rarely described in judicial opinions at all, presumably because it is considered so ineffable. When described, authorial creativity is treated very differently from invention, being referred to, for instance, as “the mysterious ebb and flow of an artist’s creative powers”¹⁷⁴ or “intrinsically individualistic.”¹⁷⁵

The use of quotations from judicial opinions is, of course, somewhat anecdotal, and broader evidence also points to differences in how judicial opinions treat artistic versus inventive creativity. Opinions, for example, are far more likely to use the term “creative” to describe artistic copyright endeavors than to describe inventive patent endeavors. Westlaw searches find 329 cases that use the term “creative” in conjunction with the author of a copyrighted work, but only forty-two cases that do the same for inventors and their inventions.¹⁷⁶ This eight-fold difference actually understates the bias towards authorial creativity because there are more than twice as many patent decisions issued by the federal courts as copyright decisions, yielding about a twenty-fold difference overall in the rate of referring authors versus inventors as creative.¹⁷⁷ This difference is particularly striking given that the creativity threshold for patent protection (nonobviousness) is a critical issue in many patent cases, but rarely at issue in copyright

¹⁷¹ A search of the ALLFEDS database for “copyright & search w/5 solution” identified 8 cases on February 5, 2010, none of which referred to the creative process of an author in using the term “search.”

¹⁷² *Thropp & Sons v. De Laski & Thropp*, 226 F. at 949 (citing *Quincy Mining Co. v. Krause*, 151 Fed. 1012, 1017 (6th Cir. 1907)).

¹⁷³ *Pennsylvania Research Corp. v. Lescarboursa Spawn Co.*, 29 F. Supp. 340, 343 (Dist. Ct. 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*, 550 U.S. at 427.

¹⁷⁴ *Gary Price Studios, Inc. v. Randolph Rose Collection, Inc.*, 2006 WL 1319543 (S.D.N.Y. 2006).

¹⁷⁵ *American Dental Ass’n v. Delta Dental Plans Ass’n*, 1996 WL 224494 (N.D. Ill. 1996).

¹⁷⁶ The search “copyright & creativ! /5 (artist writer playwright composer author) % “creative artists agency” % “authors and inventors”” returned 329 documents in the ALLFEDS database, while the search “patent & creativ! /5 (inventor scientist) % “creative artists agency” % “authors and inventors”” returned 42 documents all as of February 5, 2010. “Creative artists agency” was excluded as the name of a party in a commonly cited opinion; “authors and inventors” was excluded to remove common references to the Intellectual Property Clause.

¹⁷⁷ As of February 5, 2010, there are 7656 decisions in the ALLFEDS database since Dec. 31, 2007 that mention the term “patent,” but only 3210 documents that mention the term “copyright.” This disparity is not only a modern phenomena. Searches spanning the decade of the 1980s found 8712 patent cases and 3011 copyright cases; searches spanning the 1950s found 5165 patent cases and 751 copyright cases.

actions due to the minimal standard (originality). In sum, courts use significantly different language when discussing 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

Further evidence that creativity stereotypes have influenced American joint creator law is found by returning the comparative study of joint creator doctrine. Based on the substantial overall global harmonization in intellectual property law, as discussed above, the variation in different countries' joint creation laws cannot be explained by differences in subject matter or doctrine. The variation could, however, be explained by differences in cultural conceptions, 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 focus on the integration of collective inputs from many, across time, that produce a new work.¹⁷⁸ Eastern cultures also often emphasize a more relational, intuitive style of cognition.¹⁷⁹ American society, on the other hand, romanticizes individual authors and inventors to a greater extent, and Western cultures focus on logical, analytical thought processes.¹⁸⁰ Studies of cognitive perception, for example, reveal that individuals from Western cultures tend to focus on discrete objects and categorize the objects in order to group and organize them.¹⁸¹ Individuals from Eastern cultures, on the other hand, focus more holistically on the relationships and similarities among objects.¹⁸²

Confucius famously stated, “I transmit rather than create,” referring to the contributions of those before him.¹⁸³ This greater recognition of the contributions of many to a new work can help explain the relative ease (compared to the United States) with which many other countries, particularly many Asian countries, permit individuals to become joint authors. Similarly, some of the Asian countries permit individuals to become joint inventors more easily than in the United States, and none make it more difficult.¹⁸⁴ This is not definitive proof, but adds to the evidence that paints a picture of culturally contingent joint creator law

¹⁷⁸ See, e.g., 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 *DAEDALUS* 26, 27 (2000); 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).

¹⁷⁹ IACCINO, *supra* note 135, at 43.

¹⁸⁰ *Id.* 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.

¹⁸¹ Richard Nisbett & Yuri Miyamoto, *The Influence of Culture: Holistic versus Analytic Perception*, 9 *TRENDS IN COGNITIVE SCI.* 467 (2005).

¹⁸² *Id.*

¹⁸³ Hesse, *supra* note 178, at 43-44.

¹⁸⁴ See *supra* part I.D.

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 shortly thereafter. The development of many of the details of current joint inventor doctrine in the latter part of the twentieth century also dovetails quite nicely with the decline of romanticism and the rise of a postmodern view of creative achievement, acknowledging inputs from many sources.¹⁸⁵

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 well within the height of the romantic period. One year after *Levy*, for example, the United States Supreme Court decided *Burrow-Giles Lithographic Co. v. Sarony*,¹⁸⁶ a seminal copyright decision that has been highlighted as displaying evident romantic notions of authorship.¹⁸⁷

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.¹⁸⁸ 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.¹⁸⁹

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.¹⁹⁰ 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 revival of romantic notions of authorship in other areas of copyright law during this period.¹⁹¹

¹⁸⁵ *Supra* part I.A.

¹⁸⁶ 111 U.S. 53 (1884).

¹⁸⁷ Jaszi, *supra* note 152, at 482.

¹⁸⁸ *Id.* at 477-78.

¹⁸⁹ Fisk, *supra* note 10, 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.

¹⁹⁰ See *Maurel v. Smith*, 220 F. 195; *Marks Music v. Vogel Music*, 140 F.2d 266.

¹⁹¹ Jaszi, *supra* note 152, at 492.

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, “When you have eliminated [all other possibilities], whatever remains, *however improbable*, must be the truth.”¹⁹² 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 mind of the judges who helped shape the doctrines subsequently. Even the more recent legislative history is generally sparse, except for references to codifying existing common law. That being said, 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 variance 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 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.

C. *The Reality of Inventive and Artistic Creativity*

There are several errors in the impoverished caricature of left-brain scientists versus right-brain artists. The first is that innovative artists and scientists do not use only half their brain—inspired artistic and technological achievement usually comes from a

¹⁹² ARTHUR CONAN DOYLE, *THE SIGN OF FOUR* 93 (1890).

mix of intuitive and analytic creativity.¹⁹³ A second error is that artistic and inventive creativity are not as dissimilar as the popular conception.¹⁹⁴ As one of the leading psychologists who studies creativity writes, “there 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.”¹⁹⁵ A third error is that the historically perceived differentiation in hemispheric function was greatly overstated.¹⁹⁶ The commonly accepted left-brain/right-brain dichotomy is both oversimplified and misleading.

Despite the objective of intellectual property law to facilitate creativity,¹⁹⁷ 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.”¹⁹⁸

¹⁹³ DACEY & LENNON, *supra* note 132, at 216-17; IACCINO, *supra* note 135, at 10; *see* Torrance, *supra* note 149 (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. ANTONIO DAMASIO, *DESCARTES’ ERROR: EMOTION, REASON, AND THE HUMAN BRAIN* (1994).

¹⁹⁴ *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).

¹⁹⁵ THERESA AMABILE, *CREATIVITY IN CONTEXT* 34 (1996); *see also* SIMONTON, *supra* note 145, at 5-7 (discussing single type of creativity shared by artists and scientists); Vernon, *supra* note 135, at 440 (commenting that idea of hemispherical differentiation has been absorbed into common culture, and is over-used and over-simplified).

¹⁹⁶ DACEY & LENNON, *supra* note 132, at 204; SPRINGER & DEUTSCH, *supra* note 132, at 238-39.

¹⁹⁷ 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 America v. Universal City Studios, Inc.*, 464 U.S. 417, 429 (1984) (grant of patents and copyrights are “intended to motivate the creative activity of authors and inventors”); *Goldstein v. California*, 412 U.S. 546, 555 (1973) (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 U.C. DAVIS L. REV. 1151 (2007) (“Creativity is universally agreed to be a good that copyright law should seek to promote”); 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.*, 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); Kwall, *supra* note 197, at 1946 (noting that motivation for creativity can include “the desire for challenge, personal satisfaction, or the creation of works with a particular meaning or significance”); *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).

¹⁹⁸ J.S.G. Boggs, *Who Owns This?*, 68 CHI-KENT L. REV. 889 (1993).

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 research.¹⁹⁹ A multidisciplinary examination of these studies provides valuable insight into how the legal system can best 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. Neurobiological Understanding of 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 referred to as “dichomania,” “inaccurate and misleading,” and “more the result of imaginative guesses than of hard research.”²⁰⁰ 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.”²⁰¹ The second misperception is that the functions of the two hemispheres overlap to a much greater extent than the dichotomous speculation recognized.²⁰²

Different parts of the brain do not distinctly produce different types of creativity. Rather, creativity results from the “magic synthesis” of both hemispheres.²⁰³ 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.²⁰⁴ 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, language is more right-brain function than left-brain.²⁰⁵ 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.²⁰⁶

¹⁹⁹ Cohen, *supra* note 197, at 1152; Dreyfuss, *supra* note 107, at 1163-64. Cohen’s and Dreyfuss’ works provide two exceptions to this statement, as does Madison, *supra* note 197, at 1525 (applying interdisciplinary scholarship to copyright fair use issues). 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.

²⁰⁰ DACEY & LENNON, *supra* note 132, at 204.

²⁰¹ RESTAK, *supra* note 136, at 38.

²⁰² DACEY & LENNON, *supra* note 132, at 203-04; *see* IACCINO, *supra* note 135, at 11.

²⁰³ DACEY & LENNON, *supra* note 132, at 206 (*citing* K. Hoppe & N. Kyle, *Dual Brain, Creativity, and Health*, 3 CREATIVITY RES. J. 150 (1990)).

²⁰⁴ *Id.* at 207-08.

²⁰⁵ *Id.*; IACCINO, *supra* note 135, at 7-11.

²⁰⁶ DACEY & LENNON, *supra* note 132, at 208-09. Intriguingly, left-handed people are slightly overrepresented among the most creative people. *Id.*

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. This does not mean that people do not 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. Psychological Understanding of Creativity

Psychologists posit that creativity requires at least two, and possibly a third, elements. The first two elements are novelty and appropriateness.²⁰⁷ 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.²⁰⁸ Reproducing past work or repeating existing knowledge is not novel and therefore not creative.²⁰⁹

Appropriateness, also referred to as “adaptivity,” requires that an idea be recognized as socially useful or valuable in some way to some community.²¹⁰ 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.²¹¹

Some psychologists add a third element to the specification of creativity, requiring that a creative accomplishment be heuristic rather than algorithmic.²¹² Algorithmic tasks are projects where the path to a solution or goal is clear and straightforward.²¹³ Heuristic tasks, in contrast, are ones which lack a clear or readily-

²⁰⁷ 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 194, at 3 (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 195, 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.

²⁰⁸ SIMONTON, *supra* note 145, at 5-6; R. Keith Sawyer, *Creativity, Innovation, and Obviousness*, 12 LEWIS & CLARK L. REV. 461, 462 (2008).

²⁰⁹ SIMONTON, *supra* note 145, 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.*

²¹⁰ Sawyer, *supra* note 208, at 462; Gregory Feist, *A Meta-Analysis of Personality in Scientific and Artistic Creativity*, 2 Personality & Social Psych. Rev. 290, 290-91 (1998).

²¹¹ *Id.*; SIMONTON, *supra* note 145, at 6.

²¹² AMABILE, *supra* note 195, at 35.

²¹³ *Id.*

identifiable path to a solution.²¹⁴ Although not central to the thesis of this article, this element has significant implications for the nonobviousness requirement in patent law.²¹⁵

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.²¹⁶ Neurobiologists have found that certain aspects of creativity, such as creative imagery, appear to involve complex interactions between both brain hemispheres.²¹⁷

The psychological delineation of creativity also makes its sociocultural dependence clear. Only society can judge whether something novel is appropriate.²¹⁸ As a result, creativity depends on and results from a constantly evolving and blended soup of social, cultural, and psychological factors.²¹⁹ Consequently, creativity is 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, each of which is discussed in turn.

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.²²⁰ Post-It notes were invented by someone trying to formulate a strong, not weak, adhesive.²²¹ History is replete with spectacular inventions that were identified only as a by-product of other work. Examples include laughing gas anesthesia, electromagnetism, dynamite, the phonograph, vaccination, X-rays, penicillin, Teflon, Velcro, and that peptic ulcers are caused by bacteria, not stress.²²² Unpredictability is

²¹⁴ *Id.*

²¹⁵ 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.

²¹⁶ DACEY & LENNON, *supra* note 132, at 204-05, 214.

²¹⁷ *Id.*

²¹⁸ SIMONTON, *supra* note 145, at 6.

²¹⁹ AMABILE, *supra* note 195, at 3, 124-27; Paul Thagard & David Croft, *Scientific Discovery and Technological Innovation: Ulcers, Dinosaur Extinction, and the Programming Language Java*, in MODEL-BASED REASONING IN SCIENTIFIC DISCOVERY 136 (Lorenzo Magnani & Paul Thagard eds. 1999); DACEY & LENNON, *supra* note 132, at 15; Cohen, *supra* note 197.

²²⁰ STEPHEN VAN DULKEN & ANDREW PHILLIPS, *INVENTING THE 20TH CENTURY: 100 INVENTIONS THAT SHAPED THE WORLD FROM AIRPLANE TO THE ZIPPER* 116-17 (2002).

²²¹ *Id.* at 180-81.

²²² SIMONTON, *supra* note 145, at 35-36; Thagard & Croft, *supra* note 219, at 126.

such an important part of innovation that there is a new peer-reviewed publication titled the *Journal of Serendipitous and Unexpected Results*.²²³ Recognizing the unplanned, but not completely uncontrolled, path of invention, Louis Pasteur famously stated, “chance favors only the prepared mind.”²²⁴

Technological innovation often does not result from a straight-forward linear process. There is rarely a singular “Eureka!” moment.²²⁵ 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.²²⁶ 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.²²⁷ Henri Poincare explained, “it is by logic we prove, it is by intuition we invent.”²²⁸ 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 . . . every discovery contains an irrational element, or a creative intuition.”²²⁹ 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.²³⁰ This type of innovation involves more commonly perceived abstract thought, and research indicates that problem-finding is routinely viewed as particularly creative innovation.²³¹

Scientific creativity is viewed as similar to artistic creativity by both psychologists who study creativity and by scientists themselves.²³² Nobel laureate Max

²²³ JOURNAL OF SERENDIPITOUS & UNEXPECTED RESULTS, <http://www.jsur.org/>.

²²⁴ H. PETER ALESSO ET AL., 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. Thagard & Croft, *supra* note 219, at 134-37.

²²⁵ Sawyer, *supra* note 208, at 479; Torrance, *supra* note 149, at 29. Just recently, the Supreme Court in *KSR v. Teleflex* still seemed wedded to this unitary conception of innovation. See *KSR Int'l*, 550 U.S. at 420-21; see also Sawyer, *supra* note 208, at 479 (critiquing Court for this disposition); Sibley, *supra* note 85, at 335 (same).

²²⁶ Sawyer, *supra* note 208, at 479; Sibley, *supra* note 85, at 338-39; Twila Tardif & Robert Sternberg, *What do we Know about Creativity?*, in THE NATURE OF CREATIVITY 430 (Robert J. Sternberg ed. 1988).

²²⁷ SIMONTON, *supra* note 145, at 70-71; Sawyer, *supra* note 208, at 479; Cohen, *supra* note 197, at 1189.

²²⁸ ROGER S. FRANTZ, TWO MINDS: INTUITION AND ANALYSIS IN THE HISTORY OF ECONOMIC THOUGHT 6 (2005).

²²⁹ KARL POPPER, THE LOGIC OF SCIENTIFIC DISCOVERY 8 (2002).

²³⁰ Sawyer, *supra* note 208, at 473-74.

²³¹ *Id.* (stating that problem-finding often produces the “most radical breakthroughs”).

²³² 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 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 145, at 50-55.

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.”²³³ Albert Einstein echoed this sentiment, noting that “imagination is more important than knowledge” for new scientific discovery.²³⁴

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.²³⁵ 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.”²³⁶

Other research has examined scientific and technological innovation as it is occurring. One researcher studied the actual mental processes that occur by observing scientists in molecular biology and immunology laboratories in the United States and other countries.²³⁷ These observations revealed that the scientific process, at least in these laboratories, did not follow a straight-forward, 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.²³⁸ The scientists devoted substantial time to understanding the unexpected outcomes, and determining whether they were the result of methodological flaws in the experiments or demonstrated a need to revise theory.²³⁹ 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!’, but ‘That’s funny . . .’”²⁴⁰

This analysis is not to state that logic and reason do not play a critical part in invention—they do. Creativity researchers recognize the important role of analytical creativity to scientific and technological endeavors just as well as the intuitive.²⁴¹ 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 reasoned by analogy or the meticulous way they would sometimes go about trying to search for potential methodological flaws in their experiments.²⁴² The bottom line is that technological invention is not an either/or but a both/and—it springs from a mixture of multiple styles of creative thought.

²³³ *Id.* at 29.

²³⁴ *Id.*

²³⁵ *Id.* at 32.

²³⁶ *Id.*

²³⁷ Dunbar, *supra* note 167, at 85-86.

²³⁸ *Id.* at 90.

²³⁹ *Id.* at 91.

²⁴⁰ CRAIG C. LUNDBERG & CHERI ANN YOUNG, FOUNDATIONS FOR INQUIRY: CHOICES AND TRADE-OFFS IN THE ORGANIZATIONAL SCIENCES 378 (2005).

²⁴¹ SIMONTON, *supra* note 145, at 62; AMABILE, *supra* note 195 at 87-90.

²⁴² Dunbar, *supra* note 167, at 87-92.

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-directed 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.²⁴³ 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."²⁴⁴ 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.²⁴⁵

Though Poe may have been exaggerating, it is also evident 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.²⁴⁶

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).²⁴⁷ Often the artist may not know what he or she is trying to achieve, nor how he or she is going to achieve it.²⁴⁸ Serendipity, likewise, can play a significant role in artistic expression, just as in technological innovation.²⁴⁹

All of this is not to say that artistic creativity does not depend heavily on more holistic, relational creativity as well. 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

²⁴³ Nearly every joint author case cited in this article involves one of these types of work.

²⁴⁴ SIMONTON, *supra* note 145, at 39.

²⁴⁵ *Id.*

²⁴⁶ Dean Keith Simonton, *The Creative Process in Picasso's Guernica Sketches: Monotonic Improvements versus Nonmonotonic Variants*, 19 CREATIVITY RES. J. 329, 330 (2007).

²⁴⁷ SIMONTON, *supra* note 145, at 21, 26.

²⁴⁸ Cohen, *supra* note 197, at 1178.

²⁴⁹ SIMONTON, *supra* note 145, at 36.

process that is intrinsically ineffable.”²⁵⁰ 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.”²⁵¹ 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.”²⁵²

Artists’ and scientists’ struggle to describe their own creativity is matched by researchers’ limited understanding of what exactly occurs cognitively during the creative process.²⁵³ These struggles are also matched by evaluators’ difficulty in describing why they perceive something to be, or to not be, creative—a task that people find extremely challenging.²⁵⁴ Intriguingly, despite the difficulty of describing why something is or is not creative, both lay people and experts are found to be remarkably consistent across individuals in judging the creativity of artistic, verbal, and problem-solving achievement.²⁵⁵ 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.²⁵⁶ Even the historic examples of iconic inventors used earlier (Edison, Bell, and Salk), for instance, did not unitarily achieve their inventions; their work was only accomplished within a framework of many prior advances and much concurrent collaboration.²⁵⁷ Edison, for example, had a huge laboratory full of engineers conducting research on the light bulb.²⁵⁸ He not only relied on the work of many before him, but may even have taken his idea from Joseph

²⁵⁰ Cohen, *supra* note 197, at 1151.

²⁵¹ Roger Sessions, *The Composer and His Message*, in *THE CREATIVE PROCESS* 36, 39 (Brewster Ghiselin ed. 1952).

²⁵² SIMONTON, *supra* note 145, at 32. Though there is significant similarity of cognitive processes for creativity in the arts and sciences, there is also evidence of 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 210, at 299-300. Creative artists, however, tend to be more emotionally instable, cold, and rejecting of group norms than scientists. *Id.*

²⁵³ AMABILE, *supra* note 195, at 33.

²⁵⁴ *Id.* at 62.

²⁵⁵ *Id.* at 44-79.

²⁵⁶ Sawyer, *supra* note 208, at 479-81; Jaszi, *supra* note 152, at 455-63.

²⁵⁷ See, e.g., Gregory Mandel, *Thomas Edison’s Patent Application for the Incandescent Light Bulb*, in *MILESTONE DOCUMENTS IN AMERICAN HISTORY* (Paul Finkelman ed., 2008); 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).

²⁵⁸ Mandel, *supra* note 257, at 979.

Swan, a contemporary British inventor who prevailed over Edison in a patent dispute in England.²⁵⁹

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 ideas. One can protect the expression or physical embodiment of an idea, but not the idea itself.²⁶⁰ 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.²⁶¹

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.”²⁶² 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.”²⁶³ The “giants” of the past, as well as contributions of those in the present, 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 and a combination of cognitive processes. Rather than displaying opposite forms, truly inspired creativity, whether artistic or inventive, usually springs from a combination of both analytic and intuitive ingenuity.²⁶⁴ Too much intuitive dominance and the output will be highly original, but 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.²⁶⁵ Consider ancient Greece, Persia, and China; Europe during the Renaissance; the Industrial Revolution; and the modern valuation of American, European, and Asian technological advance as paradigmatic examples. Legal regimes that promote creativity are highly valuable; those that hinder creativity greatly problematic.

²⁵⁹ *Id.* at 983.

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

²⁶¹ Cohen, *supra* note 197, at 1170.

²⁶² *Id.* at 1153; *see also* Feist, *supra* note 210, at 302 (providing a model of influence of personality on creativity that includes genetic, social, and motivational influences); Madison, *supra* note 197, at 1587-88, 1679 (noting importance of cultural and social context to authorship).

²⁶³ PATRICIA FARA, *NEWTON: THE MAKING OF GENIUS* 207 (2004).

²⁶⁴ AMABILE, *supra* note 195, at 34; SIMONTON, *supra* note 145, at 70-71.

²⁶⁵ *Id.* at 1.

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.²⁶⁶ Some commentators argue for more complex objectives concerning balancing the incentives among various potential creators across time, and others argue for substantially different goals, including natural rights, rewards, and securing an environment for greater human flourishing.²⁶⁷ Usually ignored in these debates is that most theories of intellectual property law share a common ambition. Almost all agree that, at base, intellectual property should promote creativity.²⁶⁸ Promoting creativity serves both the incentive goals of intellectual property and advances more holistic personal, cultural, and social interests.

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 authors and inventors does not demonstrate that there is anything problematic about the doctrine. Regardless of the accuracy of the stereotypes or truth of the myths, the fundamental question is whether existing joint creator law “promotes the progress” to the fullest extent feasible. Joint creator law should be reformed not because it is based on myth, but for consequential goals. The following discussion reveals that reliance upon mistaken stereotypes of creativity has led to a system that does not appear to optimally promote intellectual creation. 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 can be viewed as establishing a set of default rules for allocating rights between the primary developer of an invention or artistic work and a more modest secondary contributor. The case of equal contributors is relevant as well (although apparently rarely in dispute), and is also covered by this analysis. 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.

²⁶⁶ See, e.g., 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); LANDES & POSNER, *supra* note 6, at 37-84 (discussing incentive theories of intellectual property).

²⁶⁷ See, e.g., Cohen, *supra* note 197 (discussing effects of society and culture on copyrightable works); 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); Justin Hughes, *The Philosophy of Intellectual Property*, 77 GEO. L.J. 287, 337-44 (1988) (discussing rights and individual liberty theories of copyright).

²⁶⁸ *Supra* note 204.

Based on this understanding, copyright's joint author laws appear to prefer protecting the dominant author at the potential expense of a modest contributor, while patent's joint inventor laws appear to defend the minor contributor from the dominance of the primary inventor.²⁶⁹

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 favored 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 were 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 more often appears to take into account notions of equity as well as efficiency, whereas patent law is typically more fully efficiency oriented.²⁷⁰

In addition, although dominant creators will sometimes be more sophisticated, this is hardly always the norm. In the context of copyright, consider an independent book author, songwriter, playwright, or screenwriter (dominant authors) who delivers a work to an institutional editor or producer (more sophisticated secondary contributors). In the context of patent, consider an independent researcher or doctor (dominant inventor) who enters into a joint venture with another research entity or investment group (more sophisticated secondary contributors).

Information-forcing goals are another way to explain certain default rules,²⁷¹ but also 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 the modest contributor, particularly as it often places him or her in a position to be taken advantage of by the primary author. 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."²⁷² It is also unclear from an efficiency perspective, however, 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*, where

²⁶⁹ See Kwall, *supra* note 62, at 52 (discussing joint author doctrine privileging dominant over nondominant authors); Robert Harris, *Conceptual Specificity as a Factor in Determination of Inventorship*, 67 J. PAT. & TRADEMARK OFF. SOC'Y 315 (1985) (stating that post-1984 Amendment patent decisions "evinced 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.").

²⁷⁰ Burk, *supra* note 157, at 1597-99; Wiley, *supra* note 3, at 119.

²⁷¹ See Bradley Karkkainen, *Information-Forcing Environmental Regulation*, 33 FLA. ST. U. L. REV. 861 (2006) (discussing use of regulations for information-forcing purposes).

²⁷² *KSR Int'l*, 550 U.S. at 427 ("the results of ordinary innovation are not the subject of exclusive rights under the patent laws. Were it otherwise patents might stifle, rather than promote, the progress of useful arts."); *Feist Publications*, 499 U.S. at 349 (The "primary objective of copyright [is to] promote the progress of science and the useful arts"); see also footnote 266.

the court appeared fixated on identifying a single author of a work, as opposed to recognizing the possibility of multiple contributors.²⁷³ At first glance, this might seem efficient in certain circumstances, including the production of motion pictures as well as other complex works. Imagine how difficult it could be to commercialize a movie if every contributor held a joint copyright interest? Digging deeper, however, indicates that this may be a bit of a red herring. 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. 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, and therefore that minor patent contributors would have their rights foreclosed even more strictly. The law, however, is exactly the opposite, providing easier nondominant rights in the patent context.

Further, the joint author bias against collaborative work is unlikely to be efficient in general, either in 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 out of concern that they will not receive appropriate reward for their effort. Such problems can be contracted around by knowing potential joint authors, but contract negotiations and the potential for litigation increase the transaction costs of collaboration. The bias for dominant authors will, at the margin, reduce collaborative efforts and the production of collaborative works. Similarly, the bias for sole authorship will reduce distribution of a work. Two authors who can independently exploit a work will produce greater distribution than one.

Does this mean that joint inventor law efficiently promotes collaboration? Apparently not. 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.²⁷⁴

Obviously, 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 may be aware but contract around it. For example, certain of these problems are resolved in copyright by the work-for-hire doctrine, pursuant to which the entity who paid to have a work created, rather than the actual creator, is entitled to copyright in the work and regarded as the author for the purposes of copyright law.²⁷⁵ Patent law has no work for hire doctrine, but research

²⁷³ Kwall, *supra* note 62, at 60 (referring to opinion in *Aalmuhammed v. Lee*, 202 F.3d at 1232, as “reveal[ing] the court is fixated on a definition of “authorship” which embodies a single creative entity”).

²⁷⁴ 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).

²⁷⁵ 17 U.S.C. §201(b). 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. Certain types of works, including motion pictures, are classified as works for hire if the parties agree in writing. *Id.*

organizations often solve these (and other) problems by contracting for rights to employee inventions as a condition of employment.²⁷⁶

For parties between the extremes of complete ignorance of joint creator law and privately negotiated contract, 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 “legalistic” agreements or lawyers.²⁷⁷ This group will also include those who are not directly aware of joint creator laws, but who operate in a social setting where there is a general culture of concern about being treated fairly if one contributes to an endeavor.²⁷⁸ Contributors often do not adequately consider their intellectual property rights beforehand, or even if considered, do pay enough attention *ex ante* to clearly define their respective rights, such as by contract.²⁷⁹ Even where a private agreement among potential collaborators delineating intellectual property rights is formed, the contract may turn out to be insufficiently comprehensive, or turn out to be unclear in the hindsight of a dispute.²⁸⁰ The difficulties and costs of private solutions are made evident by the recent rise in joint creator litigation.²⁸¹

The difficulty of achieving sufficient and comprehensive private agreements is a particular problem for intellectual property endeavors because the goal of such agreements is often the development of 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 can be exploited or further developed. Such uncertainties can lead to underutilization of a valuable creation.²⁸² 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.²⁸³ Their work led to the discovery of the AIDS virus (perhaps as a result of inadvertent cross contamination), creating the possibility for highly profitable research into diagnostic tests and vaccines for AIDS. The resulting disputes over patent and attribution rights were not just resource-draining, but delayed critical research.²⁸⁴

All of these effects also impact the common culture around collaborative research, such that even those who might be unaware of joint creator laws now operate in a culture that has been shaped by their form. The effect of a general culture of concern around

²⁷⁶ Fisk, *supra* note 10, at 1131. Patent law does have a common law shop right doctrine that grants employers a nonexclusive license in any invention made through use of the employers’ resources. *Id.*

²⁷⁷ See Dreyfuss, *supra* note 107, at 1172 (“many scientists and artists have cultural aversions to lawyers and legal matters.”).

²⁷⁸ Sung, *supra* note 274, at 435-38 (discussing how law of joint inventorship has led to anxiety among researchers about exchanging information).

²⁷⁹ Dreyfuss, *supra* note 107, at 1165.

²⁸⁰ See *id.* at 1169-82 (discussing a number of examples where private agreements failed, either because they were not properly entered or because they were not sufficiently comprehensive).

²⁸¹ Sung, *supra* note 274, at 435; Sean Seymore, *My Patent, Your Patent, or Our Patent? Inventorship Disputes within Academic Research Groups*, 16 ALB. L.J. SCI. & TECH. 125 (2006); see *Ethicon v. U.S. Surgical*, 135 F.3d at 1472.

²⁸² Sung, *supra* note 274, at 435-38; Dreyfuss, *supra* note 107, at 1165, 1176-77.

²⁸³ *Id.* at 1173.

²⁸⁴ *Id.*

collaborative work has been documented in reports that reveal the deleterious effect of apprehension over joint creator law on scientific researchers and authors.²⁸⁵

The negative effect of inefficient (and inequitable) joint creator law is impossible to quantify, but the evidence above, and the recent rise in joint creator litigation, demonstrates that it is real. Certainly, much collaboration goes on. We do not know, however, how much more would occur, and how much more valuable it would be, in a superior legal regime.

2. Collaboration and Creativity

The disincentive effects of joint author and joint inventor law may have been less troubling when the doctrines developed a century or two ago, but they are highly problematic now 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.²⁸⁶ Collaboration has become more common and more necessary in both technological and artistic fields.²⁸⁷ Congress recognized this in the 1984 Amendments to the Patent Act, designed to promote team research.²⁸⁸ The trend towards collaboration is also evident in patent filings, where the average number of inventors listed per patent has increased by fifty percent from the 1970s to the 2000s.²⁸⁹ As Professor Rochelle Dreyfuss points out, the extraordinarily advanced achievements and specialization that have occurred mean that individuals often do not have the intellectual capacity to make further advances without collaboration.²⁹⁰ The entire field of nanotechnology, for example, is so multidisciplinary, involving advanced aspects of physics, chemistry, and biology, that collaboration is essential for most work.²⁹¹ Collaboration is also required in the arts, for instance to produce works that will appeal to individuals across a wide range of cultures or globally.²⁹² Professors Yochai Benkler, Arti Rai, Katherine Strandburg,

²⁸⁵ See, e.g., THE LAW AND STRATEGY OF BIOTECHNOLOGY PATENTS 138 (Kenneth Sibley ed., 1994) (noting that issue of inventorship is a “constant source of confusion” for collaborative team work); Sung, *supra* note 274, at 435-38 (discussing how law of joint inventorship has led to anxiety among researchers about exchanging information); Boggs, *supra* note 198, (discussing issues of joint creator interaction and rights).

²⁸⁶ Dreyfuss, *supra* note 107, at 1162 (“The creative industries [the arts and sciences] have evolved: collaborative production is replacing individual effort.”); Sung, *supra* note 274, at 416-19; Kwall, *supra* note 62, at 63-64.

²⁸⁷ Fisk, *supra* note 151, at 82; Dreyfuss, *supra* note 107, at 1162-63; Sibley, *supra* note 85, at 338-39; INTERNATIONAL EXPERT GROUP ON BIOTECHNOLOGY, INNOVATION, AND INTELLECTUAL PROPERTY, TOWARD A NEW ERA OF INTELLECTUAL PROPERTY: FROM CONFRONTATION TO NEGOTIATION (2008) (report concluding that current intellectual property system discourages collaboration, retarding biotechnology development).

²⁸⁸ See *supra* note 26.

²⁸⁹ Dennis Crouch, *The Changing Nature of Inventing: Collaborative Inventing*, <http://www.patentlyo.com/patent/2009/07/the-changing-nature-inventing-collaborative-inventing.html>, July 9, 2009 (reporting an average of 1.6 inventors per patent in the 1970s and 2.5 inventors per patent in the 2000s).

²⁹⁰ Dreyfuss, *supra* note 107, at 1162, 1216.

²⁹¹ Gregory Mandel, *Nanotechnology Governance*, 59 ALA. L. REV. 1323, 1328-31 (2008); see Dreyfuss, *supra* note 107, at 1162 (making similar point for biotechnology).

²⁹² *Id.*; see also Madison, *supra* note 197, at 1686 (discussing value of making “connections between previously unconnected phenomena”).

and others have explained 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.²⁹³ 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.²⁹⁴

The importance of collaboration to promoting creativity in both the arts and the sciences is demonstrated by a variety of psychological and sociological research. Experiments reveal that individuals exposed to strongly unrelated images generate more creative artistic outputs than those not so exposed, as judged by independent raters.²⁹⁵ 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.²⁹⁶ Similarly, scientists identified by their peers as the most creative are more likely to have had exposure to information from different scientific disciplines.²⁹⁷ 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.²⁹⁸

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.²⁹⁹ The more widely varied the connected concepts, the more creative the result is perceived.³⁰⁰ As Einstein explained, “combinatory play seems to be the essential feature in productive thought.”³⁰¹ A similar point is made by Professor Cohen 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.”³⁰² The opportunity for associatively rich connections will increase with collaboration.

²⁹³ YOCHAI BENKLER, *THE WEALTH OF NETWORKS: HOW SOCIAL PRODUCTION TRANSFORMS MARKETS AND FREEDOM* 1-8 (2006); Katherine Strandburg, *Evolving Innovation Paradigms and the Global Intellectual Property Regime*, 41 CONN. L. REV. 861, 878-89 (2009); Arti Rai, *Open and Collaborative Research: A New Model for Biomedicine*, in *INTELLECTUAL PROPERTY RIGHTS IN FRONTIER INDUSTRIES* 131-34 (Robert W. Hahn ed. 2005).

²⁹⁴ See BENKLER, *supra* note 302, at 59-90 (discussing peer production in software, information, and other contexts); Strandburg, *supra* note 302, at 878-89 (discussing peer production in software, agriculture, and biotechnology); Rai, *supra* note 302, at 140-45 (discussing open and collaborative software, database, and biomedical peer production).

²⁹⁵ SIMONTON, *supra* note 145, at 46.

²⁹⁶ Sarnoff A. Mednick, *The Associative Basis of the Creative Process*, 69 PSYCHOLOGICAL REV. 220 (1962).

²⁹⁷ AMABILE, *supra* note 195, at 87.

²⁹⁸ Sean O'Connor, *The Central Role of Law as a Meta Method in Creativity and Entrepreneurship* (2009) (draft on file with author).

²⁹⁹ SIMONTON, *supra* note 145, at 28; See also Sawyer, *supra* note 208, at 465-67 (discussing “conceptual combination” as type of creativity that can lead to innovation)

³⁰⁰ *Id.*; SIMONTON, *supra* note 145, at 28.

³⁰¹ *Id.* at 29.

³⁰² Cohen, *supra* note 197, at 1190; see also DACEY & LENNON, *supra* note 132, at 88-93 (discussing role of culture in creativity).

Studies of invention indicate that extraordinary innovation usually arises from integrating teachings from disparate fields, an outcome also much more likely in collaborative research.³⁰³ 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.³⁰⁴ 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.³⁰⁵

As E.M. Forster famously wrote in the epigraph to his novel *Howard's End*, the most important thing in life is to “Only connect.”³⁰⁶ 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 thus makes clear that collaboration is a valuable driver of creative achievement. 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. After a work or invention has been achieved, joint interests 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 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. These proposals are explicated in the following sections.

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.³⁰⁷ The outcomes would be more efficient because they would provide the proper incentives to potential collaborators—both to produce creative works and to

³⁰³ Sawyer, *supra* note 208, at 480-81.

³⁰⁴ SIMONTON, *supra* note 145, at 123-25.

³⁰⁵ Cohen, *supra* note 197, at 1191 (collecting examples).

³⁰⁶ E.M. FORSTER, *HOWARD'S END* 3 (Alfred A. Knopf 1921).

³⁰⁷ See Dreyfuss, *supra* note 107, at 1220 (recommending new statutory category of work besides works for hire and joint authorship, called “collaborative work,” that would provide proportional rights).

collaborate. The outcomes would be more equitable because each joint creator would be rewarded in proportion to his or her contribution.

The current all-or-nothing rules of joint authorship and joint inventorship makes the results in many cases problematic, and renders the disparate rules between patent and copyright easy to criticize. Existing law draws huge distinctions based on seemingly irrelevant distinctions. 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 multi-faceted 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 rise of the strong intent and independent copyrightability requirements appear to have resulted from concern that modest contributors not be awarded equal (and undeserved) shares in a copyright.³⁰⁸ Rather than distorting the 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 modest interest in the copyright.

The all-or-nothing consequences of current 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.³⁰⁹ Because tenants in common each own an undivided interest in their property, courts reason, their interests must be split equally.³¹⁰ 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.³¹¹

Although hardly the norm, equitable apportionment has a small foothold in international intellectual property law. Japan awards damages in copyright infringement lawsuits to coauthors in proportion to their contribution to a work.³¹² Japanese patent law

³⁰⁸ See, e.g., *Aalmuhammed v. Lee*, 202 F.3d at 1235-36 (raising concerns about “extend[ing] joint authorship to many overreaching contributors”); *Childress v. Taylor*, 945 F.2d at 508 (noting that consideration of the 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).

³⁰⁹ H.R. Rep. No. 94-1476 at 121 (1976); *Ethicon v. U.S. Surgical*, 135 F.3d at 1470-71 (Newman, J., dissenting).

³¹⁰ See *Community for Creative Non-Violence v. Reid*, 846 F.2d at 1497 (holding that joint author profits are equally divided even if the authors’ contributions were not equal); *Ethicon v. U.S. Surgical*, 135 F.3d 1456 (holding joint inventors hold equal interests in a patent even if inventors contributions were not equal).

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

³¹² Copyright Act, art. 117 (Japan).

remains somewhat unclear as to whether it follows the same rule.³¹³ Recently, British courts have begun to follow suit, occasionally awarding joint authors unequal shares in a joint work, based upon the scope of each individuals' contribution.³¹⁴

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.³¹⁵ These rules can also reduce transaction (including litigation) costs *ex post* by filling unrecognized gaps in agreements.³¹⁶ 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.³¹⁷ 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, conceptually and legally, partially divorce 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 such differentiation. The Patent Act does not tie joint inventorship to equal ownership interests; as discussed, Judge Newman recommended severing joint inventorship and equal ownership in her dissent in *Ethicon*.³¹⁸ The Copyright Act states that "the authors of a joint work are co-owners of copyright in the work," but does not require that they be equal co-owners.³¹⁹

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.³²⁰ Copyright is somewhat akin, but due to its accounting requirement, does provide variance between different ownership shares.³²¹ Equitable apportionment doctrine would resolve this apparent enigma.

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 apportionment results in much litigation concerning how to apportion ownership interests, its transaction costs could exceed its benefits. This seems unlikely to be the case. First, most parties that contract around the current default rules generally already

³¹³ Mary LaFrance, *A Comparative Study of United States and Japanese Laws on Collaborative Inventions, and the Impact of those Laws on Technology Transfers*, INST. INTELL. PROP. BULL. 86, 90 (2005).

³¹⁴ *Fisher v. Brooker*, EWHC 3239 (Eng. 2006).

³¹⁵ Dreyfuss, *supra* note 107, at 1166.

³¹⁶ *Id.*

³¹⁷ *Id.* at 1169-82.

³¹⁸ 35 U.S.C. § 116; *Ethicon v. U.S. Surgical*, 135 F.3d at 1469-70 (Newman, J., dissenting).

³¹⁹ 17 U.S.C. § 201(a).

³²⁰ 35 U.S.C. § 262; Merges & Locke, *supra* note 41, at 589.

³²¹ NIMMER ON COPYRIGHT § 6.12(B) (2008); *Accountability Among Co-owners of Statutory Copyright*, notes, 72 HARV. L. REV. 1550, 1563-64 (1959).

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 litigation that is initiated.³²² Third, although there will be an additional issue to litigate in some cases (the shares of the joint creators), providing a continuum rather than an all-or-nothing rule should make negotiated settlements more likely, reducing overall litigation expenses.³²³ Last, equitable apportionment will hopefully shift the culture around collaboration from the current concern about rights and relationships to a more positive encouragement of 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 creativity threshold for copyright protection.³²⁴ 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."³²⁵ It is unclear why persons "trained only to the law" constitute better judges of the innovation present in technological invention, but that is a topic for another article.³²⁶ There is a significant difference between Holmes' concern about value-neutral copyright protection and the question of apportioning collaborator rights. Holmes' primary concern was about judges picking winners and losers in the marketplace of ideas.³²⁷ 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

³²² George Priest & Benjamin Klein, *The Selection of Disputes for Litigation*, 13 J. LEGAL STUDIES 1 (1984).

³²³ See, e.g., Alberto Galasso & Mark Schankerman, *Patent Thickets and the Market for Innovation: Evidence from Settlement of Patent Disputes*, CEPR Paper No. 6946, available at www.cepr.org/pubs/dps/DP6946.asp (reporting faster settlement agreements where there is greater certainty in outcome).

³²⁴ *Bleistein v. Donaldson Lithographing Co.*, 188 U.S. 239, 251-52 (1903).

³²⁵ *Id.*

³²⁶ See Gregory Mandel, *The Non-Obvious Problem: How the Indeterminate Non-Obvious Standard Produces Excessive Patent Grants*, 42 U.C. DAVIS L. REV. 57 (2008) (discussing challenges of having non-expert judges and juries evaluate nonobviousness of technological inventions).

³²⁷ *Bleistein v. Donaldson Lithographing*, 188 U.S. at 251-52.

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 nothing, it would require almost intentional misfeasance for judges to do worse under an equitable apportionment regime, and it is highly likely they can amply surpass this modest benchmark. If judges and jurors can apportion tort liability based on degree of contribution to an accident in comparative negligence jurisdictions,³²⁸ there is no reason they cannot apportion contributions to creative works and inventions sufficiently as well.

2. Requiring a Non-Market 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 contribution sufficient to be a joint author or joint inventor in the first instance. The research on creativity and collaboration provide useful insight for how to improve joint creator law here 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.³²⁹ 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 contribution to conception, not insignificant contribution, and non-public domain requirements.

A non-market 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 non-market standard would resolve current ambiguity concerning whether only a contribution to conception is satisfactory, or whether a contribution to reduction to practice can suffice for joint inventorship.³³⁰ Contributions to reduction to practice 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 non-market rule does 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 non-market 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.

³²⁸ See *Hilen v. Hays*, 673 S.W.2d 713, 719-20 (Ky. 1984) (adopting pure comparative negligence); 18 AM. JUR. 2D *Contribution* § 69 (2008).

³²⁹ See Steven Kan, *Attribution Determination for True Inventors and Authors* 11-12 (unpublished manuscript), available at www.ssrn.com (discussing non-market substitutable knowledge as a basis for attribution rights).

³³⁰ See *supra* note 38.

The effect of the non-market contribution standard on copyright doctrine is more substantial. The standard would not notably change the independent copyrightability element of joint authorship doctrine. Importantly, it would continue to provide a bulwark against the Supreme Court's concern, expressed in *Dastar Corp. v. Twentieth Century Fox Film Corp.*, that too low a copyright standard would produce an infinite regress of copyright owners, a concern shared in other joint authorship cases as well.³³¹

The non-market substitutable standard 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.³³² The non-market 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 non-market 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.³³³ So too, a research assistant, secretary, or draftsman who performs routine duties would not be entitled to joint rights, in accord with case law.³³⁴ 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.³³⁵ In addition, the non-market standard provides an objective standard for evaluating merit, rather than the subjective standard that concerned Judge Holmes in *Bleistein*.³³⁶

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 a somewhat similar system can function well. In both areas, as discussed, many issues will

³³¹ 539 U.S. 23, 35 (2003); *Gaiman v. McFarlane*, 360 F.3d at 659 (noting that if standard for contribution is too low, "almost every expressive work would be a jointly authored work, and copyright would explode").

³³² *Aalmuhammed v. Lee*, 202 F.3d at 1235-36 (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 at 507-08; Dreyfuss, *supra* note 107, at 1206.

³³³ *Childress v. Taylor*, 945 F.2d at 507.

³³⁴ *See*, *Seshadri v. Kasraian*, 130 F.3d 798, 803 (7th Cir. 1997) (discussing that such contributors are not entitled to joint authorship).

³³⁵ *Janky v. Lake County Convention & Visitors Bureau*, Nos. 07-2350, 07-2762, & 08-1606 (7th Cir. Aug. 3, 2009) (holding that collaborator who contributed ten percent of song's lyrics is entitled to joint authorship).

³³⁶ *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 a work, and arguing that such level can be judged and differentiated).

be handled through *ex ante* contracting. Where issues arise in the absence or interstices of contracts, the multiplicity of authors should result in greater, not reduced, distribution.

The non-market substitutable standard comes with the pedigree of relating joint creator doctrine back to the psychological understanding of creativity. Generally, a contribution will not satisfy the non-market standard unless it is novel, appropriate, and heuristic. Where a contribution is algorithmic, it will only satisfy the standard when it was not readily available. The non-market 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 non-market 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.³³⁷

The non-market 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 where a non-market contribution is made. In addition to efficiency, the non-market requirement appears equitable, awarding rights only where 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 is hardly unique in the law. Law's twin goals of equity and efficiency often lead to opposing outcomes. Joint creator doctrine, however, is one area where both objectives can be harmonized through the proposed non-market substitutable contribution and equitable apportionment rules.

CONCLUSION

The Supreme Court has oft explained that intellectual property law exists to promote creativity and the creation and distribution of creative works.³³⁸ 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 development has produced laws that discourage certain creative and collaborative work, and consequently retard potentially great creative advances.

³³⁷ The non-market 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, e.g.,* 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).

³³⁸ *See supra*, note 197.

Multidisciplinary research in psychology, neurobiology, sociology, and anthropology now provides a wealth of insight concerning the inaccuracies in common cultural stereotypes about right-brain artists and left-brain inventors. This insight not only reveals problems with intellectual property law, but, even more importantly, provides valuable teachings concerning how to actually incent creativity and collaboration. These insights provide lessons for joint inventor and joint author doctrine, and also for other areas in which patent and copyright law diverge, potentially including the creativity threshold and the attribution, scope, and duration of intellectual property rights. Intellectual property law should mine the rich resources provided by these other disciplines in order to reach its full potential to promote the progress in technology and the arts.