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Intellectual Property and Collaborative Research

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Intellectual Property and Collaborative Research

Summary

Innovative individuals and firms have increasingly engaged in collaborative research. The greater complexity of modern technology, heightened specialization in advanced fields, improved means of communications, and the desire to share the risks and expenses of high technology research have each contributed to this trend. Congressional interest in creating an environment conducive to collaborative research has resulted in numerous legislative initiatives. The Patent Law Amendments Act of 1984 and the Cooperative Research and Technology Enhancement (CREATE) Act of 2004 are among those that have clarified patent law rules regarding joint inventors and cooperative research endeavors.

Observers have nonetheless expressed concerns that applicable patent law standards may discourage, rather than foster, collaboration among researchers. Some patent law experts believe that current rules identifying the members of a research team who qualify as joint inventors are too lenient, vague, and unpredictable. This standard may lead to uncertainties with respect to patent ownership. It may also encourage strategic claims drafting during patent acquisition and enforcement.

Another target of concern is the current legal rule governing the joint ownership of patents. In the event more than one individual is considered to be a co-inventor of an invention that is patented, each such person is regarded as a joint owner of that patent. U.S. patent law further deems a joint owner of a patent to enjoy a "tenancy-in-common," which allows him to exploit a patent without regard to the other owners. This property rule appears to maximize the opportunity for exploitation of the patented invention in the marketplace. Yet, because every inventor receives full rights in an invention no matter what the extent of his contribution, this ownership principle could possibly lead to inequitable distributions of the profits of patented inventions.

If Congress should deem a legislative response to be appropriate, some commentators have called for more specific legislative guidance on the joint inventorship standard. A possible reform would be to stipulate bright-line rules, or possibly a list of factors that courts should consider, with respect to joint inventorship. On the other hand, fashioning a workable standard of joint inventorship might prove difficult or ultimately be unnecessary.

In addition, alternative ownership rules–such as considering ownership on a claim-by-claim, rather than a patent-by-patent basis–are a possibility. In weighing the desirability of any alternative to the current regime, concerns for ease of judicial administration and the diminution of the incentives of one joint owner to commercialize the patented invention may be appropriate. However, the patent statute's joint inventorship and joint ownership standards are effectively default rules. As collaborative researchers may reach alternative arrangements via contract, legal reform in this area may not be a compelling need.

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Intellectual Property and Collaborative Research

Congressional interest in creating an environment conducive to collaborative research has resulted in numerous legislative initiatives. The intellectual property laws are among those that have been amended to account for the needs of joint researchers. The Patent Law Amendments Act of 1984,[1] the American Inventors Protection Act of 1999,[2] and the Cooperative Research and Technology Enhancement (CREATE) Act of 2004[3] each clarified patent law rules regarding joint inventors and cooperative research endeavors. These laws have attempted to facilitate cooperation among researchers, while at the same time maintaining patent-based incentives that are sufficient to stimulate research in the first instance.

Legislative attention towards collaborative research issues has been stimulated by the growing prominence of research partnerships among and between private sector firms, universities, and the federal R&D establishment.[4] Many reasons explain why cooperative projects have become an increasingly attractive vehicle for innovation. The greater complexity of modern technology has caused individuals and firms to specialize, necessitating cooperation in order to achieve desired results.[5] The advent of advanced communications networks, including the Internet, has further enabled collaboration.[6] The desire to share the risks and expenses of high technology research among multiple participants has further stimulated cooperative ventures.[7]

Observers have expressed concerns, however, that applicable patent law standards may hinder, rather than foster, collaboration among researchers. Some patent law experts believe that current rules identifying the members of a research team who qualify as joint inventors are too lenient, vague, and unpredictable.[8] Another target of concern is the current legal rule governing the joint ownership of

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[1] P.L. 98-622, 98 Stat. 3383.

[2] P.L. 106–113, 113 Stat. 1501.

[3] P.L. 108-453, 118 Stat. 3596.

[4] CRS Issue Brief IB89056, *Cooperative R&D: Federal Efforts to Promote Industrial Competitiveness*, by Wendy H. Schacht.

[5] *See* Rochelle Cooper Dreyfuss, "Collaborative Research: Conflicts on Authorship, Ownership, and Accountability," 53 *Vanderbilt Law Review* (2000), 1161.

[6] *See* Lawrence M. Sung, "Collegiality and Collaboration in the Age of Exclusivity," 3 *DePaul Journal of Health Care Law* (2000), 411.

[7] Dreyfuss, *supra* note 5.

[8] *See* Joshua Matt, "Searching for an Efficacious Joint Inventorship Standard," 44 *Boston College Law Review* (2002), 245.

patents. U.S. patent law allows each owner to exploit a patent without regard to the other owners.[9] This legal arrangement appears to maximize the opportunity for exploitation of the patented invention in the marketplace.[10] Yet it could possibly lead to inequitable distributions of the profits of patented inventions and may promote mistrust among potential joint researchers.[11]

This report reviews intellectual property laws and policies governing collaborative research. First, it reviews the increasing tendency towards joint research in high-technology fields. After providing the fundamentals of patent law and innovation policy, the report then reviews the detailed rules of patent law as applied to collaborative research. The report next surveys issues concerning the patent law standards for joint inventorship and joint ownership, and provides some concluding observations.

The Role of Collaborative Research in Technological Innovation

Technological development has increasingly resulted from cooperative ventures formed between and among the private sector, universities, and government entities.[12] Several developments in the modern research environment have contributed to this trend towards collaboration. One factor is the growth of the communications networks, including the Internet, which collectively have made collaboration over long distances much easier.[13]

The growing complexity of modern technology has ramifications upon the cost of conducting research, the specialization of researchers, and the ability to innovate. Cooperation may benefit firms by allowing them to share risks and costs. High technology research is often expensive, and many firms have found limited associations with other entities more cost effective than hiring needed expertise on a permanent basis. Coupled with reported declines in public financing, cost increases have also encouraged academic researchers to find new sources of financial support.[14]

The extreme complexity of many modern technologies has also led to the growing specialization of individual researchers. Because few persons are able to master numerous sophisticated and ever-advancing scientific fields, breakthroughs

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[9] 35 U.S.C. § 262 (2004).

[10] Robert P. Merges & Lawrence A. Locke, "Co-Ownership of Patents: A Comparative and Economic View," 72 *Journal of the Patent and Trademark Office Society* (1990), 586.

[11] Philip Konecny, "Windfall Property Rights for the Left Out Co-Inventor Who Gets Let Into the Patent," 16 *Santa Clara Computer & High Technology Law Journal* (1999), 141.

[12] *See* Anna Martina Tyreus, "H.R. 2391: Protecting Universities in Collaborative Research," 82 *Washington University Law Quarterly* (2004), 557.

[13] *Id.*

[14] *See* Brett Frischmann, "Innovation and Institutions: Rethinking the Economics of U.S. Science and Technology Policy," 24 *Vermont Law Review* (2000), 347.

at the frontiers of scientific knowledge increasingly depend upon interdisciplinary research.[15] Trends for individual researchers are also reflected within the institutions in which they operate. Even elite, multinational enterprises may lack the expertise to perform cutting-edge research on their own. They may instead turn to government laboratories, universities, or other entities in order to gain access to expertise and equipment not readily available elsewhere.[16]

Congress has also endeavored to create an environment conducive to research associations between and among public, private, and non-profit entities. Among the legislative initiatives in this area is the National Cooperative Research Act,[17] which aimed to encourage companies to undertake joint research through clarifications of the antitrust laws. The Bayh-Dole Act allowed universities, nonprofit institutions, and small businesses to obtain title to patents on inventions resulting from government-funded research.[18] The Stevenson-Wydler Act contained provisions concerning assignment of title to inventions arising from collaborative work between federal laboratories and outside cooperating parties where no direct federal funding is involved.[19] In addition, Congress has provided tax and other incentives to stimulate joint research projects.[20]

Although supporters of collaborative research cite its numerous potential advantages, some observers have voiced concerns over this trend. First, collaboration may effectively reduce the number of researchers working on a particular problem. In the manner of an anticompetitive corporate merger, a joint venture may potentially slow the pace of industrial research.[21]

Second, experience demonstrates that joint ventures may be employed to facilitate cartels and other collusive behavior. In particular, as a collaborative research and development project may call for close, continuing cooperation between two firms, such an arrangement may ultimately decrease the participants' willingness

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[15] *See* Dreyfuss, *supra* note 5.

[16] *See* Mark Stevenson, "Technology Transfer and March-In at the National Institutes of Health: Introducing Uncertainty Into An Era of Private-Public Partnership," 50 *Administrative Law Review* (1998), 515.

[17] P.L. 98-462, 98 Stat. 1815, as amended by the National Cooperative Production Amendments Act of 1993, P.L. 103-42, 107 Stat. 117.

[18] P.L. 96-517, 94 Stat. 3015. *See* CRS Report RL32076, *The Bayh-Dole Act: Selected Issues in Patent Policy and the Commercialization of Technology*, by Wendy H. Schacht.

[19] P.L. 96-517, 94 Stat. 3019.

[20] *See* Richard S. Markovits, "On the Economic Efficiency of Using Law to Promote Research and Development: A Critique of Various Tax, Antitrust, Intellectual Property, and Tort Law Rules and Policy Proposals," 39 *Harvard Journal on Legislation* (2002), 63.

[21] *See* Richard J. Hoskins, "Antitrust Analysis of Joint Ventures and Competitor Collaborations: A Primer for the Corporate Lawyer," 10 *University of Miami Business Law Review* (2002), 119.

to act as vigorous rivals in the marketplace.[22] Third, joint ventures may reduce competition by excluding or hampering outsiders from access to technology or other resources that are essential to participate in a particular market.[23]

Finally, some commentators have viewed government support for particular joint ventures as particularly problematic. Such support has been characterized as "picking winners and losers" in the marketplace.[24] Others believe that the government has consistently been a poor judge of selecting projects to award with federal funding.[25] Despite these concerns, there can be little doubt that collaborative efforts form a significant component of research and development projects in the United States.[26]

Patent Law Fundamentals

Joint research sometimes leads to technological breakthroughs that in turn may be subject to patent protection. This report next reviews both the innovation policies that shape patent law doctrines, as well as the practical workings of the patent system as applied to collaborative research.

Patents and Innovation Policy

The patent system is intended to promote the production and dissemination of technological information. Many commentators have argued that the patent system is necessary to encourage individuals to engage in inventive activity.[27] Proponents of this view reason that, absent a patent system, inventions could easily be duplicated by free riders, who would have incurred no cost to develop and perfect the technology involved, and who could thus undersell the original inventor. The resulting inability of inventors to capitalize on their inventions would lead to an environment where too few inventions are made. By providing individuals with exclusive rights in their inventions for a limited time, the patent system allows inventors to realize the profits from their inventions.

The courts have also suggested that absent a patent law, individuals would favor maintaining their inventions as trade secrets so that competitors could not exploit

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[22] *See* Joseph Kattan, "Antitrust Analysis of Technology Joint Ventures: Allocative Efficiency and the Rewards of Innovation," 61 *Antitrust Law Journal* (1993), 937.

[23] *See* Joseph F. Brodley, "Joint Ventures and Antitrust Policy," 95 *Harvard Law Review* (1982), 1521.

[24] *See, e.g.,* Alan F. Lindsay III, "Tuning Into HDTV: Can Production Joint Ventures Improve America's High-Tech Picture?," 44 *University of Miami Law Review* (1990), 1159.

[25] *See* Ronald J. Sutherland & Jerry Taylor, "Time to Overhaul Federal Energy R&D," *Policy Analysis* no. 424 (Feb. 7, 2002).

[26] *See* Katttan, *supra* note 22.

[27] E.g., Dan L. Burk & Mark A. Lemley, "Policy Levers in Patent Law," 89 *Virginia Law Review* (2003), 1575.

them.[28] Trade secrets do not enrich the collective knowledge of society, however, nor do they discourage others from engaging in duplicative research. The patent system attempts to avoid these inefficiencies by requiring inventors to consent to the disclosure of their inventions in issued patent instruments.[29]

There are still other explanations for the patent laws. For instance, the Patent Act of 1952[30] is thought by supporters to stimulate technological advancement by inducing individuals to "invent around" patented technology. Issued patent instruments may point the way for others to develop improvements, exploit new markets or discover new applications for the patented technology.[31] The patent system may encourage patentees to exploit their proprietary technologies during the term of the patent. Proponents believe the protection provided by a patent's proprietary rights increases the likelihood a firm will continue to refine, produce and market the patented technology.[32] Finally, the patent law has been identified as a facilitator of markets. Absent patent rights, an inventor may have scant tangible assets to sell or license, and even less ability to police the conduct of a contracting party. By reducing a licensee's opportunistic possibilities, the patent system lowers transaction costs and makes technology-based transactions more feasible.[33]

The patent system has nonetheless attracted a great number of critics. Some assert that the patent system is unnecessary due to market forces that already suffice to create an optimal level of invention. The desire to gain a lead time advantage over competitors may well provide sufficient inducement to invent without the need for further incentives.[34] Some commentators observe that successful inventors are sometimes transformed into complacent, established enterprises that use patents to suppress the innovations of others.[35] Others assert that the inventions that have fueled some of our most dynamic industries, such as early biotechnologies and computer software, arose at a time when patent rights were unavailable or uncertain.[36]

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[28] A "trade secret" is a formula, process, device, or other business information that is kept confidential in order to maintain an advantage over competitors. *See* James Pooley, *Trade Secrets* § 1.01 (1998).

[29] *See, e.g.,* Grant v. Raymond, 31 U.S. 218, 247 (1832).

[30] P.L. 82-593, 66 Stat. 792 (codified at Title 35 United States Code).

[31] *See* R. Polk Wagner, "Information Wants to Be Free: Intellectual Property and the Mythology of Control," 103 *Columbia Law Review* (2003), 995.

[32] F. Scott Kieff, "Property Rights and Property Rules for Commercializing Inventions," 85 *Minnesota Law Review* (2004), 697.

[33] *See* Robert P. Merges, "Intellectual Property and the Costs of Commercial Exchange: A Review Essay," 93 *Michigan Law Review* (1995), 1570.

[34] *See* Frederic M. Scherer & David Ross, *Industrial Market Structure and Economic Performance* (Rand McNally & Co., 3d ed. 1990).

[35] *See* Robert P. Merges and Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 *Columbia Law Review* (1990), 839.

[36] *See, e.g.,* Pamela Samuelson, Benson *Revisited: The Case Against Patent Protection for Algorithms and Other Computer Program–Related Inventions*, 39 *Emory Law Journal*

(continued...)

While these various justifications and criticisms have differing degrees of intuitive appeal, none of them has been empirically validated. No conclusive study broadly demonstrates that we get more useful inventive activity with patents than we would without them. The justifications and criticisms of the patent system therefore remain open to challenge.[37]

Patent Acquisition and Enforcement

In order to obtain patent protection, innovative individuals and firms must prepare and submit applications to the U.S. Patent and Trademark Office ("USPTO").[38] USPTO officials, known as examiners, then assess whether the application merits the award of a patent.[39] The patent acquisition process is commonly known as "prosecution."[40]

Under the Patent Act of 1952,[41] a patent application must include a specification that so completely describes the invention that skilled artisans are able to practice it without undue experimentation. This requirement is referred to as "enablement." The patent specification must also provide information upon the "best mode" known to the inventor of practicing the invention.[42]

The Patent Act also requires that applicants draft at least one claim that particularly points out and distinctly claims the subject matter that they regard as their invention.[43] In practice most patent applications contain multiple claims. Each claim sets out a distinct proprietary interest that the patent applicant asserts for himself.

While reviewing a submitted application, the examiner will determine whether the claimed invention fulfills certain substantive standards set by the patent statute. Two of the most important patentability criteria are *novelty* and *nonobviousness*. To be judged novel, the claimed invention must not be fully anticipated by a prior patent, publication or other knowledge within the public domain.[44] The sum of these earlier materials, which document state-of-the-art knowledge that is accessible to the public, is termed the "prior art." To meet the standard of nonobviousness, an invention must

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[36] (...continued)
(1990), 1025.

[37] *See* CRS Report RL31951, *Innovation, Intellectual Property, and Industry Standards*, by John R. Thomas.

[38] 35 U.S.C. § 111 (2004).

[39] 35 U.S.C. § 131 (2004).

[40] John R. Thomas, "On Preparatory Texts and Proprietary Technologies: The Place of Prosecution Histories in Patent Claim Interpretation," 47 *UCLA Law Review* (1999), 183.

[41] Act of July 19, 1952, Ch. 950, 66 Stat. 797.

[42] 35 U.S.C. § 112 ¶ 1 (2004).

[43] 35 U.S.C. § 112 ¶ 2 (2004).

[44] 35 U.S.C. § 102 (2004).

not have been readily within the ordinary skills of a competent artisan based upon the teachings of the prior art.[45]

Should the USPTO allow the application to issue as a granted patent, the owner or owners of the patent obtain the right to exclude others from making, using, selling, offering to sell, or importing into the United States the claimed invention.[46] Each inventor named in the patent is presumed to be its owner.[47] If the patent has multiple owners, each joint owner is presumed to own an undivided interest in the entire patent, and each may exploit the patented invention without the need to obtain permission from any other joint owner. As the Patent Act states:

> In the absence of any agreement to the contrary, each of the joint owners of a patent may make, use, offer to sell, or sell the patented invention in the United States, or import the patented invention into the United States, without the consent of and without accounting to the other owners.[48]

This ownership arrangement is formally known as a "tenancy-in-common."[49]

The term of the patent is ordinarily set at 20 years from the date the patent application was filed.[50] Patent title therefore provides inventors with limited periods of exclusivity in which they may practice their inventions, or license others to do so. Patent owners bear responsibility for monitoring their competitors to determine whether they are using the patented invention or not. Patent owners who wish to compel others to observe their intellectual property rights must usually commence litigation in the federal district courts. The U.S. Court of Appeals for the Federal Circuit ("Federal Circuit") possesses exclusive national jurisdiction over most patent appeals from the district courts,[51] while the U.S. Supreme Court possesses discretionary authority to review cases decided by the Federal Circuit.[52]

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[45] 35 U.S.C. § 103 (2004).

[46] 35 U.S.C. § 271(a) (2004).

[47] *See* University Patents, Inc. v. Kligman, 762 F. Supp. 1212, 1218-19 (E.D. Pa. 1991) ("Although 'ownership' and 'inventorship' are not identical for patent law purposes, they are related. Inventorship provides the starting point for determining ownership of patent rights. The true and original inventor must be named in the application for a patent and, absent some effective transfer or obligation to assign the patent rights, the original inventor owns the right to obtain the patent").

[48] 35 U.S.C. § 262 (2004).

[49] *See* Peter M. Carrozzo, "Tenancies In Antiquity: A Transformation of Concurrent Ownership for Modern Relationships," 85 *Marquette Law Review* (2001), 423.

[50] 35 U.S.C. § 154(a)(2) (2004).

[51] 28 U.S.C. § 1295(a)(1) (2004).

[52] 28 U.S.C. §1254(1) (2004).

Federal Legislation Impacting Collaborative Research and the Patent System

The Patent Law Amendments Act of 1984

Prior to 1984, the patent statutes did not include express provisions that stated the legal standards for inventorship. This situation resulted in judicial holdings that, in the view of some observers, were not conducive to collaborative research. For example, some courts required that an individual contribute to the subject matter of each claim within a patent in order to qualify as a joint inventor.[53] Being excluded from inventorship leads to the result that the individual would also not be considered an owner of the patent. Before 1984, some commentators believed this result led to an atmosphere of caution among potential joint researchers.[54] Under such a rule, entities that made significant contributions to a research project could nonetheless be denied the rewards of patent ownership, due merely to imprecisions or strategic decision-making during the drafting of the patent's claims.[55]

Concerns also arose that the patent law's standard of joint inventorship was not keeping pace with conditions in modern industrial research laboratories. State-of-the-art research often involves numerous individuals who make different levels of contribution to a project, sometimes sporadically and over a long period of time. Some observers believed the requirement that each named inventor make a contribution to the subject matter of every claim was unrealistic in view of these industrial conditions. As explained by Gerald J. Mossinghoff, then the Commissioner of Patents and Trademarks:

> Complying with this requirement is sometimes difficult and at times impossible. Scientists or researchers in an organization often work on a particular aspect or embodiment of the invention, or on only a portion of the invention, while others work on different aspects, embodiments or portions. Scientists are continually added to a research team, while other scientists leave the team. Concepts and development plans generated through brainstorming cannot always be accurately attributed. The preparation of patent applications . . . nevertheless requires the attorney to determine the inventorship of each claim . . . . Adequate protection for an invention may require the filing of several applications to cover the separate contributions to all of its aspects.[56]

By enacting the Patent Law Amendments Act of 1984, Congress responded to both of these issues. As amended by the 1984 legislation, section 116 of the Patent

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[53] *See, e.g.,* Rival Mfg. Co. v. Dazey Prods. Co., 358 F. Supp. 91, 101 (W.D. Mo. 1973).

[54] *See* W. Fritz Fasse, "The Muddy Metaphysics of Joint Inventorship: Cleaning Up After the 1984 Amendments to 35 U.S.C. § 116," 5 *Harvard Journal of Law and Technology* (1992), 153.

[55] *Id.*

[56] Hearings on H.R. 3285, H.R. 3286, and H.R. 3605 Before the Subcomm. on Courts, Civil Liberties, and the Administration of Justice of the House Comm. on the Judiciary, 98th Cong., 2d Sess. 61 (1984) (testimony of Commissioner Mossinghoff).

Act stipulates that individuals may be joint inventors "even though (1) they did not physically work together or at the same time, (2) each did not make the same type or amount of contribution, or (3) each did not make a contribution to the subject matter of every claim of the patent."[57] This language mirrors that of an earlier judicial opinion, *Monsanto Co. v. Kamp*.[58] In that case the U.S. District Court for the District of Columbia considered whether the defendants, Kamp and Jahn, had appropriately been named as inventors on a patent claiming a polyethylene-lined plastic bottle. In finding the two were properly considered joint inventors, the court explained:

> A joint invention is the product of collaboration of the inventive endeavors of two or more persons working toward the same end and producing an invention by their aggregate efforts. 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. Each needs to perform but a part of the task if an invention emerges from all of the steps taken together. 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. One may take a step at one time, the other an approach at different times. One may do more of the experimental work while the other makes suggestions from time to time. 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.[59]

The 1984 amendments also provided legislative mechanisms for correcting the identity of the inventors listed on a patent. Traditionally, the incorrect naming of inventors had significant consequences for the validity of the patent.[60] Either the improper addition of a person who was not in fact an inventor, which is termed "misjoinder" in patent parlance, or the failure to name a correct inventor, which is termed "nonjoinder," were strict grounds for patent invalidity.[61]

This longstanding patent law doctrine was believed to clash with the needs of contemporary industry. With the increasingly collaborative nature of research came larger teams of researchers, which in turn increased the possibility of mistakes in the identification of inventors. The patent law's draconian sanction for the misnaming

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[57] 35 U.S.C. § 116 (2004).

[58] 269 F. Supp. 818 (D.D.C. 1967).

[59] *Id.* at 824.

[60] *See, e.g.,* Pointer v. Six Wheel Corp., 177 F.2d 153, 157, 83 USPQ 43, 47 (9th Cir. 1949) ("it has been held repeatedly that a valid patent can only be granted to the real inventor, that the original and first inventor must make the application, and that, in the case of a patent which is a joint invention, a patent issued to one only of the inventors is void."); City of Milwaukee v. Activated Sludge, Inc., 69 F.2d 577, 587, 21 USPQ 69 (7th Cir. 1934) ("When a number of persons make an invention jointly, a valid patent can not be taken out in the name of one of them."); Smart v. Wright, 227 F. 84, 87 (8th Cir. 1915) ("the machine was the result of the joint thought and action of the two men, Wright and Smart. That being the case, neither of them could secure a valid patent as sole inventor.").

[61] Pannu v. Iolab Corp., 155 F.3d 1344, 1349-50, 47 USPQ2d 1657, 1662 (Fed. Cir. 1998).

of inventors, coupled with the absence of mechanisms for correcting mistakes, were believed to be ill-suited for modern conditions.

The Patent Law Amendments Act of 1984 provided a response to this situation by retaining the rule that identifying the correct inventor or inventors is a condition of patentability.[62] However, this legislation allowed for the correction of both nonjoinder and misjoinder errors.[63] As codified in § 256 of the Patent Act, the USPTO may issue a certificate correcting inventorship so long as these errors arose without deceptive intent. Section 256 also allows for courts to issue orders requiring the USPTO to correct the listing of inventors on a particular patent.[64]

The 1984 legislation also amended the definition of "prior art" to exclude certain "in-house" knowledge–known to members of a collaborative research team but not to the general public–from qualifying as "prior art" under the Patent Act.[65] Congress confirmed and slightly broadened this exemption when it enacted the American Inventors Protection Act of 1999.[66] Due to this legislation, in-house information may not be cited against patent applications filed by joint researchers, at least for purposes of patent law's nonobviousness requirement.[67] This provision is currently codified at § 103(c)(1) of Title 35, United States Code.

A review of the history of this legislation may aid understanding of this rather technical provision. Congress enacted the 1984 and 1999 statutes in response to the judicial opinion in *In re Bass*.[68] In that case, three joint inventors, Bass, Jenkins, and Horvat, applied for a patent on an air control system for carding machines. Their application was rejected because, in the view of the USPTO and the court of appeals, the invention it claimed would have been obvious in view of the "prior art."[69] However, the prior art demonstrating the obviousness of the invention in part

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[62] 35 U.S.C. § 102(f) (2000) ("A person shall be entitled to a patent unless – (f) he did not himself invent the subject matter sought to be patented . . . ."); 35 U.S.C. § 111 (2000) ("Application for patent shall be made, or authorized to be made, by the inventor, except as otherwise provided by this title . . . .").

[63] Patent Law Amendments Act of 1984, P.L. 98-622, 98 Stat. 3383.

[64] Hess v. Advanced Cardiovascular Sys., Inc., 106 F.3d 976, 980 (Fed. Cir. 1997).

[65] Patent Law Amendments of 1984, P.L. 98–622, § 104, 98 Stat. 3385.

[66] P.L. 106–113, 113 Stat. 1501 (Nov. 29, 1999).

[67] Stated in more precise terms, the statute exempts prior art arising from "one or more of subsections (e), (f), and (g)" of § 102 from consideration in the nonobviousness inquiry under § 103(a), if certain conditions are met. Specifically, the putative prior art under § 102(e), (f) or (g), as well as the claimed invention, must either be owned by, or subject to an obligation of assignment to, a single entity at the time the invention was made.

[68] 474 F.2d 1276 (CCPA 1973).

[69] As described earlier in this report, the term "prior art" refers to the patent, publications, and other sources of information that describe state-of-the-art knowledge that is known to the public. This information is compared to the claimed invention to determine whether the invention is novel and nonobvious, and therefore eligible for patenting.

consisted of two U.S. patents: one granted to Bass and Horvat, and another issued to Jenkins.[70]

The correspondence of inventor surnames between the application and the prior art patents was not a coincidence–the prior art patents had been granted to the same Bass and Horvat, in the one case, and the same Jenkins in the other, as were seeking the new patent. This meant that these inventors' own earlier work had been cited against them to establish obviousness. Ordinarily, the patent statute makes it clear that an inventor's own prior inventive efforts may not anticipate her own subsequent patent application.[71] However, the *Bass* court reasoned that an opposite approach was permissible because of a traditional patent law principle that treats each new combination of joint inventors as a distinct "inventive entity." This rule applies even where these combinations share individual inventors.

Under the "inventive entity" rule, the team of Bass, Jenkins and Horvat is considered a different inventive entity than the team of just Bass and Horvat. Each group of natural persons essentially acquires its own legal identity; they, as a whole, constitute "the inventor" of that technology. On this view, the two prior art patents at issue in the *Bass* litigation were, as matter of legal technicality, the work of a different "inventor" from the one seeking the present patent, and thus relevant prior art.[72]

Concerns arose that the holding in *In re Bass* was not conducive to joint research. Large research institutions may employ numerous technologists to engage in collaborative research and development efforts, and there may be a constant shifting in the composition of inventive teams working on different projects. Applying the rule of *In re Bass* in this setting could lead to a denial of patent rights even if only a slight change in personnel occurred. In a particularly fertile and interactive corporate research department, inventors could find themselves unable to obtain patents due to "in-house" rejections for obviousness based upon efforts by their peers, and even in part by themselves.[73]

Congress intended § 103(c)(1) to solve the problem highlighted in *In re Bass* by exempting certain prior art from the obviousness analysis in joint research and development settings. Section 103(c)(1) is a narrowly worded provision, however.

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[70] 474 F.2d at 1287.

[71] There are some exceptions to this basic rule. In particular, if an inventor discloses an invention through a publication or public use, or places the invention "on sale," but waits more than one year to file a patent application, then the inventor's earlier disclosure will defeat his prospective patent rights. *See* 35 U.S.C. § 102(b) (2004). Generally speaking, however, information in the public domain qualifies as "prior art" only if it is the work of "another." *See, e.g.,* 35 U.S.C. § 102(e) (2004).

[72] 474 F.2d at 1287.

[73] *See* generally Brian P. Murphy, "Oddzon Products and Derivation of Inventions: At Odds with the Purpose of Section 102(f) of the Patent Act?," 9 *Fordham Intellectual Property, Media & Entertainment Law Journal*(1999), 529; Eric K. Steffe *et al.*, "Biotech Collaborations and Maximizing Patent Protection: Two Hypotheticals," 27 *American Intellectual Property Law Association Quarterly Journal* (1999), 167.

Generally speaking, if a reference is available not merely in-house, but in fact to the public at large, then it may still be used to defeat the patent or patent application.[74]

The CREATE Act

The 108th Congress enacted additional legislation that expanded the existing exemption for in-house research. The Cooperative Research and Technology Enhancement (CREATE) Act,[75] signed by President Bush on December 10, 2004, was enacted in response to a decision of the Court of Appeals for the Federal Circuit, *Oddzon Products, Inc. v. Just Toys, Inc.*[76] The *Oddzon* decision held that certain in-house research, potentially performed by one of a group of collaborative researchers, constituted prior art and could potentially be patent-defeating.[77] Congress intended that the CREATE Act, which was codified at 35 U.S.C. § 103(c)(2) and (3), would stimulate joint research by eliminating this source of prior art from the nonobviousness inquiry.

The CREATE Act operates by extending the circumstances under which the 35 U.S.C. § 103(c)(1) exemption applies. In particular, when a claimed invention resulted from joint research between two or more entities, the CREATE Act excludes certain prior art developed by one of the researchers from the nonobviousness analysis if:

- the claimed invention was made by or on behalf of parties to a joint research agreement that was in effect on or before the date the claimed invention was made;
- the claimed invention was made as a result of activities undertaken within the scope of the joint research agreement; and
- the application for patent for the claimed invention discloses or is amended to disclose the names of the parties to the joint research agreement.[78]

The term "joint research agreement" is defined as "a written contract, grant, or cooperative agreement entered into by two or more persons or entities for the performance of experimental, developmental, or research work in the field of the

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[74] Stated in more technical terms, if the prior art qualifies under another paragraph of 35 U.S.C. § 102–for example, under the "printed publication" or "public use" bar of § 102(b)–then the § 103(c)(1) exemption does not apply.

[75] Pub. L. 108–453, 118 Stat. 3596 (2004) ("CREATE Act"). *See* CRS Report RS21882, *Cooperative R&D and the Cooperative Research and Technology Enhancement (CREATE) Act*, by Wendy H. Schacht.

[76] 122 F.3d 1396 (Fed. Cir. 1997).

[77] Stated more precisely, the *Oddzon* decision held that subject matter that qualifies as prior art only under 35 U.S.C. § 102(f) may be used for purposes of a nonobviousness analysis under 35 U.S.C. § 103(a). *Oddzon*, 122 F.3d at 1403.

[78] 35 U.S.C. §103(c)(2) (2004).

claimed invention."[79] The CREATE Act applies to any patent, including a reissue patent, granted on or after December 10, 2004.[80]

As explained by the House Committee on the Judiciary, "the CREATE Act provides a simple means of extending the 'safe harbor' provisions of current law that treats inventions of a common owner similarly to inventions made by a single person."[81] Under this legislation, inventions generated through collaborative research are treated as if they were made by a single individual, or subject to an obligation of assignment to the same individual, if a joint research agreement has been reached prior to the development of the invention. This legal fiction in turn allows joint researchers to take advantage of the prior art exemption under Section 103(c)(1) of the Patent Act.[82]

Current Issues

Congressional amendments to the Patent Act of 1952 in 1984, 1999, and 2004 have clarified and refined the legal standards governing collaborative research. In the view of some observers, however, additional concerns exist with respect to the governing patent law standards. This report considers two of these issues: the standard of inventorship itself, as well as the property rules regulating joint ownership of patents.

Standards of Joint Inventorship

The 1984 amendments to the Patent Act stipulated that individuals may be joint inventors "even though (1) they did not physically work together or at the same time, (2) each did not make the same type or amount of contribution, or (3) each did not make a contribution to the subject matter of every claim of the patent."[83] It can be appreciated that this language offers a negative definition–that is to say, the statute identifies certain conditions that do not disqualify an individual from being considered an inventor. But this provision does not affirmatively specify the level of technical contribution needed to allow an individual to rise to the level of an inventor, and therefore be named on the patent instrument.[84]

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[79] 35 U.S.C. §103(c)(3) (2004).

[80] CREATE Act, §3.

[81] U.S. Congress, House of Representatives, House Committee on the Judiciary, *Cooperative Research and Technology Enhancement (CREATE) Act of 2003*, House Report 108-425, 108th Cong, 2d sess., Feb. 24, 2004, at 5.

[82] 35 U.S.C. § 103(c)(1)(2004). Recall that under this provision prior art available only under paragraphs (e), (f), and (g) of section 102 may be excluded for purposes of nonobviousness if both the putative prior art and the claimed invention were in fact owned or subject to an obligation of assignment by one of the joint researchers.

[83] 35 U.S.C. § 116 (2004).

[84] *See* Fina Oil & Chem. Co. v. Ewen, 123 F.3d 1466, 1473 (Fed. Cir. 1997) (noting that § (continued...)

Some commentators believe that the lack of an affirmative statutory definition of inventorship contributes to the difficulties of determining, under certain factual situations, whether a particular individual qualifies as an inventor. Of course, since the inventors named on a patent are presumptively its owners, this determination has very significant practical consequences for collaborative research projects. Suppose, for example, that two firms each provide one of their employees to work on a joint research project. Suppose further that the project results in a patented invention, but only one of the employees is considered to be an inventor that can be named on the patent. In that situation, unless the two firms have stipulated otherwise via contract, then only one of the firms will own the patent. If the other firm practices the patented invention, its former research partner would be able to bring charges of infringement against it.[85]

Although no specific statutory language defines which individuals may be considered a joint inventor, a number of judicial opinions concerning inventorship disputes provide some guidance to industry. Most patent law experts agree that at least some basic principles regarding joint inventorship are clear from the case law. As summarized by the Federal Circuit:

> All that is required is that the [joint inventor] (1) contribute in some significant manner to the conception or reduction to practice of the invention; (2) make a contribution to the claimed invention that is not insignificant in quantity, when that contribution is measured against the dimension of the full invention, and (3) do more than merely explain to the real inventors well-known concepts and/or the current state of the art.[86]

Some examples illustrate this standard. Suppose, for example, that a laboratory technician merely follows the instructions of a chemist in order to synthesize a new compound. Because he made no inventive contribution to the project himself, he would not be judged a joint inventor.[87] On the other hand, suppose that the chemist had the general idea of the properties of a desirable new compound, but had no idea how to actually make that compound. Through research, the laboratory technician develops the new techniques needed to formulate the compound. In such a case, the chemist and the laboratory technicians would likely be judged joint inventors.[88]

Beyond this basic guidance, however, the determination of contested patent inventorship has been deemed highly fact specific, with results varying on a case-by-

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[84] (...continued)
116 "sets no explicit lower limit on the quantum or quality of inventive contribution required for a person to qualify as a joint inventor.").

[85] 35 U.S.C. § 271(a) (2004).

[86] Pannu v. Iolab Corp., 155 F.3d 1344, 1351 (Fed. Cir. 1998).

[87] *See* Hess v. Advanced Cardiovascular Sys., Inc., 106 F.3d 976 (Fed. Cir. 1997).

[88] *See* Roger E. Schechter & John R. Thomas, *Principles of Patent Law* § 11.1 (2d. ed 2004).

case basis.[89] At least one court appears to agree with this assessment. As one trial court stated:

> The exact parameters of what constitutes joint inventorship are quite difficult to define. It is one of the muddiest concepts in the muddy metaphysics of the patent law. On the one hand, it is reasonably clear that a person who has merely followed instructions of another in performing experiments is not a co-inventor of the object to which those experiments are directed. To claim inventorship is to claim at least some role in the final conception of that which is sought to be patented. Perhaps one need not be able to point to a specific component as one's sole idea, but one must be able to say that without his contribution to the final conception, it would have been less-less efficient, less simple, less economical, less something of benefit.[90]

To the extent that these criticisms are accurate, they may have negative implications for collaborative research. One commentator explains:

> Given the minimal and rather vague, thus unpredictable, standards for determining inventorship, the current state of the law fosters uncertainty and apprehension regarding the contributions of various researchers or team members participating in the inventive process. In recent years, a claim of joint inventorship has become an attractive option for disgruntled scientists suing either their former research partners or former employers. Likewise, defendants accused of infringement might endeavor to find an unnamed, overlooked and minor contributor to defeat a claim of infringement. . . . Thus, the very purpose of the 1984 amendments has been turned on its ear–refurbished § 116, designed to encourage team research, may now be impeding it.[91]

As a result, some commentators have called for more specific legislative guidance on the joint inventorship standard. One possible reform would be to stipulate a clear rule, or possibly a list of factors that courts should consider, with respect to joint inventorship. This legislation could be based upon such factors as the amount of contribution made by each putative joint inventor, the relationship between these individuals, the overall size of the inventive entity, and the technological field of the invention.[92]

On the other hand, fashioning a workable standard of joint inventorship might prove very difficult. Collaborative research occurs between a number of differently situated actors, including sophisticated multinational enterprises, universities, government laboratories, and individuals, in a variety of settings.[93] As a result, identifying which individuals deserve to be named as joint inventors may inherently

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[89] *See* Jerry C. Liu, "Overview of Patent Ownership Considerations in Joint Technology Development," 2005 *Syracuse Science & Technology Law Reporter*, at 1.

[90] Mueller Brass Co. v. Reading Indus., 352 F. Supp. 1357 (E.D. Pa. 1972), *aff'd*, 487 F.2d 1395 (3d Cir. 1973).

[91] Matt, *supra* note 8, at 247-48.

[92] *Id.*

[93] *See* John J. Okuley, "Resolution of Inventorship Disputes: Avoiding Litigation Through Early Evaluation," 18 *Ohio State Journal on Dispute Resolution* (2003), 915.

call for a detailed review of the circumstances of individual cases. Articulating a single rule to govern all of these situations could potentially lead to unjust results in particular factual settings.[94]

In addition, collaborative researchers possess some ability to protect their interests in this situation. A joint researcher could, through a contract established in advance, stipulate that should he not be entitled to be named as an inventor in any patents that result from a cooperative effort, he is nonetheless entitled to be licensed or assigned an interest in those patents. As a result, even where a joint researcher is not entitled to be named as an inventor under the standards established by the patent law, he could nonetheless enjoy the patent-based rewards that result from a collaborative project. Given the ability of joint researchers to "contract around" the patent statute's inventorship standards, changes to current rules may not be a high priority for Congress.

Consequences of Joint Ownership

A second point of concern relates to the legal consequences of joint ownership. As discussed previously, if more than one individual qualifies as an inventor of a particular patented invention, then these individuals are deemed to be "joint owners" who hold the patent as "tenants-in-common."[95] Under this legal arrangement, each joint owner owns an undivided interest in the entire property. Further, each joint owner may exploit the patent without requiring consent from the others.[96]

Suppose, for example, that Firm A and Firm B engaged in a joint research project. Among the results of that project was a patent that named employees from both Firm A and Firm B as inventors. In turn, those inventors had previously assigned their rights in their patented inventions to their employers.

In this hypothetical, Firm A can use the patented invention without regard to Firm B's interests, and vice-versa. Neither firm could prevent the other from exploiting the patented invention, nor could one claim a share of any proceeds that the other firm earns. Similarly, one firm could freely license or sell its patent rights to another without interference from the other.

It should be noted that there are two important exceptions to the general rule that a joint owner of a patent may exploit the patented invention without regard to others. First, joint owners of a patent can always change their relationship by express

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[94] *See* John R. Thomas, "Formalism at the Federal Circuit," 52 *American University Law Review* (2003), 771.

[95] *See supra* notes 42-44 and accompanying text.

[96] As provided in 35 U.S.C. § 262 (2004):

> In the absence of any agreement to the contrary, each of the joint owners of a patent may make, use, offer, to sell, or sell the patented invention in the United States, or import the patented invention into the United States, without the consent of and without accounting to the other owners.

agreement. The tenancy-in-common arrangement applies only as a default in the event the owners have not ordered their affairs otherwise, through contract.[97]

In addition, joint owners of a patent are required to cooperate before bringing a patent infringement suit in federal court. 35 U.S.C. § 281 states that "A patentee shall have remedy by civil action for infringement of his patent."[98] Courts have interpreted this language as requiring the agreement of each of a patent's joint owners in order to enforce the patent through infringement litigation. Therefore, although one joint owner can manufacture, sell, license or otherwise exploit a patented invention without regard to the other joint owners, permission of the other joint owners must be had prior to commencing an infringement suit.

In light of the usual rule governing a tenancy-in-common relationship, however, some commentators have observed that joint owners of a patent are at each other's mercy.[99] The policy basis for this rule appears to be premised upon creating the maximum opportunity for the patented technology to be exploited in the marketplace.[100] For example, suppose that three different individuals are joint owners of a patent. Under the default rule established by the patent statute, anyone who wishes to sell the patented invention need only obtain a license from any one of the owners. If the rule were otherwise, procuring a license from all three owners might be more costly and difficult. The tenancy-in-common relationship also prevents one of many joint owners from a patent from "holding up" the entire transaction by demanding additional royalties or other consideration.[101]

Some commentators believe that the tenancy-in-common rule may lead to some unjust outcomes in joint research settings, however.[102] Following 1984 amendments to the patent statute, an individual may be named as an inventor even though he did not make the same type or amount of contribution as other inventors, or he did not make a contribution to the subject matter of every claim of the patent.[103] However, once an individual is a named inventor on a patent, he is deemed to be a joint owner of the entire patent instrument. These circumstances may cause him to be considered an owner of many claims to which he made no contribution.

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[97] *See* Schechter & Thomas, *supra* note 88, at § 11.1.

[98] 35 U.S.C. § 281 (2004).

[99] *See* Cilco, Inc. v. Copeland Intralenses, Inc., 614 F. Supp. 431, 434, 227 USPQ 168, 170 (S.D.N.Y. 1985) ("[C]o-owners [of a patent] are considered to have opposing interests. Each is at the mercy of the other.").

[100] *See* Merges & Locke, *supra* note 10.

[101] *See* Robert P. Merges, "The Law and Economics of Employee Inventions," 13 *Harvard Journal of Law and Technology* (1999), 1.

[102] *See* Konecny, *supra* note 11.

[103] 35 U.S.C. § 116 (2004).

This scenario was brought to light by a 1998 decision of the Court of Appeals for the Federal Circuit, *Ethicon, Inc. v. United States Surgical Corp.*[104] Here, a Dr. Yoon was named as the inventor of a patent relating to surgical tools. Along with his licensee, Ethicon, Yoon brought an infringement suit against U.S. Surgical. U.S. Surgical subsequently learned that Choi, an electronics technician, had collaborated with Yoon and made some contributions to the patented invention. U.S. Surgical then promptly obtained a license from Choi and then asked the court to name Choi as a co-inventor of the patent-in-suit. Due to this license, if Choi qualified as a co-inventor, U.S. Surgical would be considered an authorized licensee and be able to preempt the lawsuit altogether.

U.S. Surgical's strategy ultimately proved successful. The district judge ruled that Choi was a co-inventor of two of the 55 claims of the patent-in-suit and therefore was a joint owner of the entire patent.[105] Following an appeal, the Federal Circuit affirmed. The Court of Appeals cited a number of circumstantial factors that supported the conclusion that Choi had contributed to two of the asserted patent's claims. Among other factors, Yoon's need for a person with electronics expertise, the length of time they worked together, the absence of pay to Choi, and the similarity between the diagrams in the patent and the drawings in Choi's notebook each suggested that Yoon and Choi should be considered joint inventors.[106]

One of the Federal Circuit judges, Judge Pauline Newman, issued a dissenting opinion in the case. Her opinion expressed concern that Choi, who had been shown to have made a contribution to only two of the 55 claims of the patent-in-suit, was now deemed an owner of the entire patent. Judge Newman observed that prior to the 1984 amendments to 35 U.S.C. § 116, Choi would not have been considered a joint inventor because he had not contributed to each of the patent's claims. She interpreted § 116 as merely permitting the naming of additional persons as inventors on a patent instrument.

Judge Newman further explained that being named as an inventor should not necessarily result in full status as a co-owner because the concepts of joint inventorship and joint ownership are conceptually distinct. In her view, ownership rights in a patent are based on the notion that both inventors had shared equally in developing the invention. In such circumstances, a "joint tenancy" system where each inventor owns an undivided share of the entire patent is appropriate. According to Judge Newman, given the 1984 changes to the law of joint inventorship, the law of joint patent ownership deserved reassessment.[107]

Subsequent commentary has largely been sympathetic to the views of the dissenting opinion in *Ethicon v. U.S. Surgical*. Some observers believe that it is inappropriate to "transpose pre-1984 concepts of joint ownership into the new post-

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[104] 135 F.3d 1456 (Fed. Cir. 1998).

[105] 954 F. Supp. 51 (D. Conn. 1997).

[106] 135 F.3d at 1464.

[107] *Id.* at 1468.

1984 inventorship law . . . ."[108] In particular, a broad conception of joint inventorship, in combination with a tenancy-in-common ownership paradigm, may allow a joint inventor to enjoy economic rewards that are not commensurate with his contribution to the patent. Believing that this situation "frustrates the purpose of patent law," observers have called for legislative reforms so that courts can "fashion more equitable and economically efficient" distributions of patent-based rewards.[109]

A number of alternatives to the patent law's current tenancy-in-common rules exist. In the copyright law, for example, each joint owner of a copyrighted work is free to exercise any of the rights of a copyright owner without the permission of the other joint owners, and may also license others to exercise those rights as well. However, each joint owner must pay a proportional share of any profits she realizes to the other owners.[110] In theory, a similar arrangement could be dictated for joint patent owners as well.

Another possibility would be to consider ownership issues on a claim-by-claim basis, rather than a patent-by-patent basis. Put differently, courts could determine whether a putative joint inventor contributed to the subject matter of the specific claim at issue in a particular litigation. This approach would contrast with the current law, which inquires whether the putative inventor made a contribution to any one of the claims in the asserted patent.[111]

Yet another approach would be to attempt to apportion each owner's interest in a patent based upon the extent of his technical contribution to the claimed subject matter. Current law awards each joint owner an equal interest in the patent. It would be theoretically possible for courts to make more particularized determinations of the relative merits of each inventor's contribution. This rule could result, for example, in one joint owner being awarded a 70% share in the patent, while the other joint owner received a 30% share.

Other patent ownership arrangements, similar to those discussed above, may be possible.[112] In weighing the desirability of any alternative to the current regime, one factor to be considered is ease of judicial administration. To the extent that these proposals would involve more difficult determinations than the current tenancy-in-common standard, they are likely to increase the complexity and uncertainty of patent litigation.[113] Another concern may be diminution of the incentives of one joint owner to commercialize the patented invention. Even if one joint owner does not require the permission of others to exploit a patented invention in the marketplace, her incentives

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[108] Tigran Guledjian, "Teaching the Federal Circuit New Tricks: Updating the Law of Joint Inventorship in Patents," 32 *Loyola of Los Angeles Law Review* (1999), 1273.

[109] *See, e.g.,* Konecny, *supra* note 11, at 176.

[110] Schechter & Thomas, *supra* note 88, at § 6.3.

[111] *See* Steffe *et al.*, *supra* note 73, at 149.

[112] *See* Rivka Monheit, "The Importance of Correct Inventorship," 7 *Journal of Intellectual Property Law* (1999), 191.

[113] *See* Matt, *supra* note 8.

to do so may be diminished if she must pay a share of her profits to the other joint owners.[114]

In addition, the patent statute's tenancy-in-common relationship is effectively a default rule. Under current law, firms may account for any perceived shortcomings of the tenancy-in-common principle by reaching an agreement in advance that stipulates an alternative ownership relationship. As with the patent statute's standards for joint inventorship,[115] the established ability of collaborative researchers to "contract around" the patent statute may suggest that legal reform in this area is not a compelling need.

Concluding Observations

Although amendments to the patent statute have clarified rules pertaining to cooperative research and development endeavors, concerns about the standards of joint inventorship and joint ownership persist. These topics represent relatively technical aspects of the patent law. They are nonetheless subjects that have been the subject of legislative reform over the past two decades, and that are of undoubted importance to collaborative research. Although legislation currently before the 109th Congress proposes many reforms to the patent statute,[116] this proposal would retain rather than refine existing rules with respect to joint inventorship and joint ownership. As technologies and markets continue to advance, striking a balance between encouraging cooperation among researchers, while maintaining sufficient patent-based exclusivities to encourage innovation in the first instance, will continue to be in the public interest.

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[114] *See* Merges & Locke, *supra* note 10.

[115] *See supra* note 94 and accompanying text.

[116] H.R. 2795, Patent Act of 2005.