# CONCEPTION AND MISCONCEPTION IN JOINT INVENTORSHIP

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## INTRODUCTION

It is an axiom of patent law that utility patents protect "inventions" only; it is a paradox of patent law that the Patent Act does not define "invention" except tautologically: "The term 'invention' means invention or discovery."[1] Given that patents are designed to reward inventors for the disclosure of their inventions,[2] it

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[1] 35 U.S.C. § 100(a) (2006). Half of this definition is semicircular, the other half compounds its own obscurity by failing to define a "discovery," resulting in much confusion and misunderstanding as to the scope of patentable subject matter. *See* Linda J. Demaine & Aaron X. Fellmeth, *Reinventing the Double Helix: A Novel and Nonobvious Conception of the Biotechnology Patent*, 55 STAN. L. REV. 303, 368-77 (2002-2003).

[2] *See* Grant v. Raymond, 312 U.S. 218, 241-42 (1832); Graham v. John Deere Co., 383 U.S. 1, 5-8 (1966).

would have been helpful had the Act settled just what constitutes an invention. Alas, it does not. After 220 years of progressively developed patent statutes and jurisprudence, the concept of invention, so central and fundamental to patent law, has become one of the most misunderstood.

The Patent Act's obscurity on this key point of law does not prevent the Act from employing the term "invention" ubiquitously. A person is entitled to a patent unless "the invention was known or used by others in this country" or the inventor "has abandoned the invention."[3] Patentability may not be negated "by the manner in which the invention was made."[4] A person infringes the patent by making or selling the "patented invention."[5]

Among the mysteries emanating from uncertainty about what kinds of technologies qualify as a patentable invention, identifying the proper inventors has developed into one of the most intractable. Because the U.S. Constitution allows only "inventors" to obtain patents on their inventions,[6] we must know what an invention is before we can decide who qualifies as its inventor. The inventor himself has a self-evident interest in certainty about his or her entitlement to a patent as well.

In 2011, Congress supplemented the definitions section of the Patent Act through the Leahy-Smith America Invents Act ("AIA"), to take effect in March 2013, which defines the term "inventor" for the first time. However, that definition merely adds another point of confusion; it provides, "The term 'inventor' means the individual or, if a joint invention, the individuals collectively who invented or discovered the subject matter of the invention."[7] A definition stating that an inventor is the person who invents the invention would offer us nothing more than another tautology. However, the new amendment does not exactly do that; instead, it defines as the "inventor" the person who invents the

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[3] 35 U.S.C. § 102(a), (c) (2006). The America Invents Act substitutes the term "claimed invention" for "invention," and defines that term in the new Section 101(j). *See* Leahy-Smith America Invents Act, § 3, Pub. L. 112-29, 125 Stat. 284 (codified in scattered sections of 35 U.S.C.). The implications of this change will be analyzed below.

[4] 35 U.S.C. § 103(a) (2006).

[5] 35 U.S.C. § 271(a) (2006).

[6] U.S. CONST. art. I, §. 8, cl. 8; *see also* 35 U.S.C. § 111(a)(1) (2006) ("An application for patent shall be made, or authorized to be made, by the inventor, except as otherwise provided in this title . . . .").

[7] America Invents Act, *supra* note 3, § 3, *to be codified as* 35 U.S.C. § 101(f).

"subject matter" of the invention.[8] It is not immediately clear how the subject matter of an invention differs meaningfully from the invention itself. Instead of resolving a difficult and core problem of law, the new definition merely adds a point of obscurity.

The intuitive way to begin resolving this paradox is to define as an "invention" whatever satisfies the legal requirements for the grant of a utility patent. The Patent Act requires that, to qualify for a utility patent, an invention must be "novel," "non-obvious" at the time of conception (after the AIA, the "effective filing date"), and "useful."[9] But the Act and its implementing regulations also require the fulfillment of several more conditions for a patent to issue, including a written disclosure of the invention, an oath or declaration by the applicant, and the payment of a fee.[10] Surely, not all of these requirements speak to the definition of an invention. We can hardly say that a person has failed to invent something until he has signed an oath and paid a fee to the U.S. Patent and Trademark Office.[11]

At the application stage, the doctrinal analysis for invention and inventorship is deceptively straightforward. If the application satisfies the requirements of the Patent Act and regulations, the invention will be considered whatever is described in the application, and the question of inventorship will be resolved by

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[8] *Id.*

[9] 35 U.S.C. §§ 101-03 (2006). To supplement the Patent Act, it might be thought useful to look to treaties mandating standards of patent protection among state parties. The most relevant such treaty, the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights, does not define "invention," but it does specify that to qualify for a patent, an invention must be "new, involve an inventive step, and [be] capable of industrial application." TRIPS: Agreement on Trade-Related Aspects of Intellectual Property Rights art. 27(1), Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization [hereinafter WTO Agreement], Annex 1C, THE LEGAL TEXTS: THE RESULTS OF THE URUGUAY ROUND OF MULTILATERAL TRADE NEGOTIATIONS 320 (1999), 1869 U.N.T.S. 299 [hereinafter TRIPS Agreement]. Unfortunately, this adds nothing to our understanding of what constitutes an invention.

[10] 35 U.S.C. §§ 112, 115 (2006); 37 C.F.R. § 1.17. The TRIPS Agreement also requires a written disclosure, although it does not require all of the information provided for in the 1952 Patent Act, such as a best mode disclosure. *Compare* TRIPS Agreement, *supra* note 9, art. 29(1) *with* 35 U.S.C. § 112 (2006) (amended 2011).

[11] Intuitively, we might be tempted to draw a distinction between substantive and procedural requirements of patentability, with only the former qualifying as components of the definition of invention. As will be discussed, this approach would miss some core features of invention that do not clearly fall into the category of substantive criteria.

presumption. The PTO will not examine inventorship, but will usually accept without question the claims of the applicants that they originated the invention.[12]

The trouble typically arises when the patent is enforced or challenged in litigation.[13] In the disputing context, the definition of the invention does not normally assume a pivotal role because the focus of litigation tends toward the "claims." Claims are statements in the patent "particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention."[14] To infringe a utility patent, the accused infringer must generally have made, used, sold, or imported a product described in one or more of the patent's claims. If the defendant challenges the validity of the patent, the strategy is to prove the invalidity of all allegedly infringed claims.

Courts have similarly gravitated toward claims analysis to determine whether a member of a research team qualifies as an inventor. As consistently invoked by both the Supreme Court and the U.S. Court of Appeals for the Federal Circuit, the accepted patent law doctrine treats claims as if they were equivalent to the invention itself.[15] Yet, in inventorship disputes, the case for fixating on the claims is based more on pedigree than logic or policy. Claims are nearly always drafted by lawyers or patent agents after (sometimes years after) the invention was completed.[16] The claims may or may not express what the inventor conceived; they rarely express the full scope of the invention, and not infrequently capture

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[12] The PTO's Manual of Patent Examining Procedure does not even contemplate examination of inventorship. *See* MANUAL OF PATENT EXAMINING PROCEDURE ch. 700 (8th ed., July 2010 rev.), *available at* http://www.uspto.gov/web/offices/pac/mpep/index.htm [hereinafter MPEP].

[13] It may also arise in a stage of administrative review, such as in derivation proceedings conducted under 35 U.S.C. § 135, or possibly post-grant review conducted under 35 U.S.C. ch. 32.

[14] America Invents Act, *supra* note 3, § 118, *to be codified at* 35 U.S.C. § 112(b).

[15] *See* Phillips v. AWH Corp., 415 F.3d 1303, 1312 (Fed. Cir. 2005) (citing many Supreme Court and earlier Federal Circuit cases for the proposition that the claims measure the invention). However, one writer has rightly pointed out that excessive fixation on the claims tends to encourage patent applicants to claim more than they have enabled. Oskar Liivak, *Rescuing the Invention from the Cult of the Claim*, 42 SETON HALL L. REV. 1 (2012); *see also* Christopher A. Cotropia, *What Is the "Invention"?*, 53 WM. & MARY L. REV. 1855 (2012) (discussing the functional advantages of defining an invention more broadly than as the claims).

[16] An example is seen in this case study of the typical process from invention to patent. Greg Myers, *From Discovery to Invention: The Writing and Rewriting of Two Patents*, 25 SOCIAL STUDIES OF SCIENCE 1, 57, 69 (1995).

more than what the inventor invented.[17] Despite the convenience of equating the claims with invention in infringement analysis, judicial opinions equating the two have propelled patent law down a treacherous path.

The consequences of this wayward doctrine reach into the very processes of innovation. Most modern technology research is the product of collaborations between multiple scientists and engineers, usually in large research institutions.[18] Collaborations frequently involve teams from industry and universities or government agencies joining forces to advance technology despite divergent economic interests. Joint inventorship has accordingly come to assume a critical role in technological research and development. Approximately half of all patents now list more than one inventor.[19] As Congress has long recognized,[20] the patent system best achieves its goal of encouraging technological development by facilitating rather than hindering joint invention.

To achieve this goal, inventorship doctrine needs to define its criteria with sufficient specificity to allow research teams to determine who qualifies as an inventor with some confidence. To achieve maximal efficiency and fairness, those criteria should be neither overinclusive nor underinclusive. All collaborators who contribute significantly to the conception of the invention, and only those collaborators, should qualify as inventors. The consequences for a *bona fide* inventor who is excluded from a patent application covering an invention to which he contributed significantly can be devastating for the omitted inventor. The financial rewards of being named an inventor may be substantial, indeed monumental, because the inventors are the presumptive owners of the patent to the invention as tenants in common.[21] In the absence of an agreement to the contrary, a joint inventor is entitled to exploit the patented invention commercially without the consent of, or owing a duty of contribution or accounting to, the other

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[17] *See* Robert P. Merges & Richard R. Nelson, *On the Complex Economies of Patent Scope*, 90 COLUM. L. REV. 839, 848 (1990) (noting that current practice permits the stretching of claims beyond what the inventor has disclosed).

[18] *See* George Franck, *Scientific Communication — A Vanity Fair?*, 286 SCI. 53, 53 (1999); Edward T. Lentz, *Inventorship in Laboratory Research*, *in* UNDERSTANDING BIOTECHNOLOGY LAW 187, 188 (Gale R. Peterson ed., 1993).

[19] *See* John R. Allison & Mark A. Lemley, *Who's Patenting What? An Empirical Exploration of Patent Prosecution*, 53 VAND. L. REV. 2099, 2117 (2000).

[20] *See* Part I.B.1, *infra*.

[21] 35 U.S.C. § 262 (2006); *see* Lawrence M. Sung, *Collegiality and Collaboration in the Age of Exclusivity*, 3 DEPAUL J. HEALTH CARE L. 411, 425 (2000).

inventors.[22] In other words, exclusion from joint inventorship means that the putative inventor may lose all of the financial rewards of the invention, no matter how great that inventor's investment of time, resources, or creativity in the invention.[23]

Recognition as a joint inventor means not only a potential share of the economic rewards, but it may have career-altering effects. A scientist or engineer may invest months or years in a research project that ultimately results in a patent. He may expend institutional funds, exhaust grants, and stake his or her reputation on the success of the project. Frequently, hiring, promotion, or tenure depends on successful completion of the project. Exclusion from the inventorship on the resulting patent denies the researcher not only his or her just financial rewards, but career recognition that may dictate his future in academia or industry.

Fixating on claims will in many cases have no effect on inventorship determinations. Frequently, a joint inventor's contribution, if it appears anywhere in the issued patent, will be claimed expressly. But relying exclusively on claims to determine inventorship is like solving three adjacent sides of a Rubik's Cube. From some viewpoints, the puzzle appears fully solved. But the apparent order masks a fundamental incoherence evident from other viewpoints. The full puzzle cannot be solved without twisting the ostensibly finished sides back into disorder. Inventorship doctrine suffers from the same fundamental incoherence. Fixating on the claims makes inventorship doctrine seem sound when the inventor's contribution is recited *expressis verbis* in one or more claims. Other inventive contributions fall within the confused jumble of fragmentary judicial statements on the doctrine of invention. For reasons to be explained, there is no necessary correlation between the relative importance of an inventive contribution, or the effort or creativity involved in that contribution, and its expression in the claims. To deny such collaborators recognition as inventors is unfair to them, confuses basic patent doctrine, and undermines the patent law's incentive structure.

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[22] Drake v. Hall, 220 F. 905, 906 (7th Cir. 1914). The right of joint patent owners contrasts with common law rights of joint owners of other kinds of property. Tenants in common of real property, for example, have a duty of accounting for and sharing profits with other tenants. *See* 20 AM. JUR. 2D *Cotenancy and Joint Ownership* § 42 (2012). Even joint copyright owners share an undivided interest in the work. Childress v. Taylor, 945 F.2d 500, 505 (2d Cir. 1991); Weinstein v. University of Ill., 811 F.2d 1091, 1095 (7th Cir. 1987).

[23] "May" lose, because the inventor may be entitled to some compensation by prior contractual arrangement.

The purpose of this article is to disaggregate the patent claims from the invention and to restore the integrity of the concepts of invention and inventorship. This restoration will require abandoning the time-honored judicial fixation on claims. Giles Rich, frequently cited by reverent courts and patent bar alike,[24] famously said, "[T]he name of the game is the claim."[25] That phrase reflects Rich's zealous opposition to the concept of invention[26] as well as the key role of claims in limiting the patent monopoly. But the influence of his maxim has far surpassed its meager truth. As Oliver Wendell Holmes once observed, "It is one of the misfortunes of the law that ideas become encysted in phrases and thereafter for a long time cease to provoke further analysis."[27] Claims are operationally important to patent law, but inventors do not invent claims, they invent inventions. And, to coin a rather different maxim: The prevention of any mention of invention causes misapprehension. This article will explore the causes of the confusion; its consequences for inventors; and its resulting effect on U.S. technological development.

Part II of this article begins by summarizing the law governing invention and inventorship, and its development and interpretation by the Supreme Court and Federal Circuit. Joint inventorship receives special attention in this part because the case law in this area reveals especially well how fixating on the patent claims distorts patent law analysis more generally. Part II then relates how an idiosyncrasy in the standard of proof in patent litigation has reinforced distorting biases in inventorship analysis. Part III maps out how the broken link between inventorship doctrine and the public policy it is intended to promote can be repaired. Specifically, Part III.A analyzes the legislative history of the Patent Act provisions on joint inventorship to determine congressional intent and compares the current joint inventorship doctrine's misdirected fixation on claims to the policy goals sought by Congress and discusses the policy consequences. Part III.B then evaluates how the question of inventorship affects the role of the patent

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[24] *See, e.g.*, Arlington Indus., Inc. v. Bridgeport Fittings, Inc., 632 F.3d 1246, 1256 n.2 (Fed. Cir. 2011); *In re* Hiniker Co., 150 F.3d 1362, 1369 (Fed. Cir. 1998); Hilton Davis Chem. Co. v. Warner-Jenkinson Co., 62 F.3d 1512, 1539 (Fed. Cir. 1995) (Plager, J., dissenting); Two-Way Media LLC v. America Online, Inc., 508 F. Supp. 2d 526, 528 (S.D. Tex. 2007).

[25] Giles S. Rich, *The Extent of the Protection and Interpretation of Claims-American Perspectives*, 21 INT'L REV. INDUS. PROP. & COPYRIGHT L., 497, 499 (1990).

[26] *See, e.g.*, Giles S. Rich, *Why and How Section 103 Came to Be*, *in* NONOBVIOUSNESS: THE ULTIMATE CONDITION OF PATENTABILITY 1, 201 (John F. Witherspoon ed., 1980).

[27] Hyde v. United States, 225 U.S. 347, 391 (1912) (Holmes, J., dissenting).

system in technological development generally and proposes an interpretation of the Patent Act that better fulfills the goals of U.S. technology policy. Part IV concludes by summarizing the argument.

## I
## THE LAW OF INVENTION AND INVENTORSHIP

### *A. The Patent Law Concept of Invention*

Although the 1952 Patent Act uses the term "invention" throughout, the closest the Act comes to defining the term nontautologically is in Section 101: "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title."[28] This is not technically a definition, but it gives clues to one by specifying that an invention is a process or physical product that is new and useful.[29] The term "new" is almost universally interpreted as a term of art in patent law (equivalent to "novel")[30], further defined in Section 102.[31] The term "useful" is not defined in the Act but has been construed in the case law to mean that the invention offers some immediate and practical benefit to the public.[32]

While Sections 100 and 101 provides a starting point for defining invention, they are incomplete. As suggested in Part I, there are other requirements for patentability. Procedural requirements such as the inventor's oath or the application fee obviously do not figure in the definition of the invention itself. But there are other substantive requirements for an invention to qualify for patent protection, the most important of which is nonobviousness. Despite its omission

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[28] 35 U.S.C. § 101 (2006).

[29] *See In re* Nuijten, 500 F.3d 1346, 1354 (Fed. Cir. 2007) ("The four categories [process, machine, manufacture, and composition of matter] together describe the exclusive reach of patentable subject matter. If a claim covers material not found in any of the four statutory categories, that claim falls outside the plainly expressed scope of § 101 even if the subject matter is otherwise new and useful.").

[30] *See* S. REP. NO. 82-1979 (1952), *reprinted in* 1952 U.S.C.C.A.N. 2394, 2410 ("Section 102, in general, may be said to describe the statutory novelty required for patentability, and includes, in effect, an amplification and definition of 'new' in section 101."). *But see* Demaine & Fellmeth, *supra* note 1, at 385-88 (arguing that the term "new" in Section 101 should be read more broadly to exclude products of nature and natural processes from patentability).

[31] 35 U.S.C. § 102 (2006).

[32] *See* Nelson v. Bowler, 626 F.2d 853, 856 (C.C.P.A. 1980).

from Section 101 of the Patent Act, nonobviousness is in some ways the keystone of the definition of invention.

The Patent Act, as amended by the America Invents Act, defines an invention as obvious:

> if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. . . .[33]

The nonobviousness requirement lies so close to the heart of the definition of an invention because its purpose is to clarify the historically confused, and sometimes contradictory, judicial interpretation of the constitutional requirement of "invention."[34] A new technology that would have been obvious to an ordinary scientist or engineer at the critical date may qualify as an innovation in the colloquial sense, but it is not an invention in the patent law sense.[35]

A statutory analysis of the concept of invention might be expected to end here. Other requirements for obtaining a patent are usually considered procedural rather than substantive. The Patent Act itself classifies the novelty, utility, and nonobviousness requirements in a chapter of the Act ("Patentability of Inventions") separate from the chapter specifying the procedural requirements (Chapter 11—"Application for Patent"). Yet, the definition of invention remains incomplete because nothing in Sections 101 to 103 obligates the inventor to understand and appreciate the significance of his own discovery.[36] An

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[33] 35 U.S.C. § 103 (2006). Prior to the 2011 amendments, the Patent Act referred to "subject matter" rather than "claimed invention"; there is no indication that this amendment was intended to change the substantive standard of patentability.

[34] *See* Rich, *supra* note 25, at 497-99; Demaine & Fellmeth, *supra* note 1, at 365-67.

[35] The Patent Act applies to "inventions" and "claimed inventions" — it nowhere creates or deals with a concept of "unpatentable inventions." However, it may be inferred that some "inventions" are unpatentable if the applicant is either not the true inventor or fails to satisfy the procedural requirements in the patent application.

[36] *See* Invitrogen Corp. v. Clontech Labs., Inc., 429 F.3d 1052, 1063 (Fed. Cir. 2005) ("[C]onception requires that the inventor be able to define the compound so as to distinguish it from other materials, and to describe how to obtain it . . . . In other words, conception requires that the inventor appreciate that which he has invented."); *see also* Dow Chem. Co. v. Astro-

unrecognized product or process is not yet an invention at all in the patent law sense.[37]

The relevant section of the Patent Act, Section 112, is found among the procedural provisions of Chapter 11. Section 112 codifies the disclosure requirement.[38] Specifically, it requires that every patent application include a "specification" section that sets forth a full written description of the invention, "and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use" that invention.[39] Section 112 also includes the requirement that the application terminate with "claims."[40] Between the written description and the claims, the specification is supposed to alert the public to the outward bounds of the invention that will be protected by patent, and to teach the public how to make and use the claimed part of the invention. For this reason, Section 112 is commonly thought to embody the fundamental bargain of the patent system: the inventor discloses the invention to the public in exchange for a temporary legal monopoly over making, using, selling, offering to sell, or importing the invention.[41] To that extent, the enablement

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Valcour, Inc., 267 F.3d 1334, 1341 (Fed. Cir. 2001) ("[T]he date of conception of a prior inventor's invention is the date the inventor first appreciated the fact of what he made.").

[37] A distinction should be made between an invention, the novelty of which the inventor has not yet recognized and an invention, the novelty and operative characteristics of which the inventor recognizes, but whose mode of operation the inventor does not fully understand. The latter can qualify as a patentable invention, because understanding precisely how an invention achieves its purpose is not required; this is why patent applicants may frame their claims in "means-plus-function" or "step-plus-function" format. *See* 35 U.S.C. § 112(f) (2013).

[38] 35 U.S.C. § 112 (2013).

[39] *Id.* § 112(a).

[40] *Id.* § 112(b)

[41] *See, e.g.*, Bonito Boats, Inc. v. Thunder Craft Boats, Inc., 489 U.S. 141, 150-51 (1989); Kewanee Oil Co. v. Bicron, 416 U.S. 470, 480-81 (1974). The value of disclosure as a basis for the patent grant has been recurrently questioned, however. *See, e.g.*, Brenner v. Manson, 383 U.S. 519, 534 (1966) (Harlan, J., dissenting); Alan Devlin, *The Misunderstood Function of Disclosure in Patent Law*, 23 HARV. J.L. & TECH. 401, 403 (2010); Mark A. Lemley & Ragesh K. Tangri, *Ending Patent Law's Willfulness Game*, 18 BERK. TECH. L.J. 1085, 1100-02 (2003); Rebecca S. Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, 56 U. CHI. L. REV. 1017, 1028–29 (1989). Mark Lemley has argued that the real benefit of the patent to most inventors may be to avoid the risk of being excluded from practicing the technology at issue. Mark Lemley, *The Myth of the Sole Inventor*, 110 MICH. L. REV. 709, 755 (2012).

provisions of Section 112 are indeed procedural and not substantive. They establish a disclosure requirement that the applicant must fulfill in order to obtain a patent, but this requirement assumes that the inventor sufficiently appreciates what he has invented and how to reproduce it. In other words, an applicant who can fulfill the requirement to describe clearly how to make and use the invention proves that he understands the invention sufficiently, and that he "actually invented the invention claimed."[42]

*1. The Role of Conception*

Section 112 thus implies an uncodified but essential aspect of the definition of an invention. Invention has not occurred until the inventor appreciates that he or she has invented something useful, functioning, worthwhile. This subjective component of invention is inherent in the idea of "conception," which is integral to establishing the moment when the invention became entitled to a patent. Conception is considered the "touchstone" of invention,[43] and has been defined as "the complete performance of the mental part of the inventive act" and "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."[44] Conception is incomplete unless the idea of the invention "is so clearly defined in the inventor's mind that only ordinary skill would be necessary to reduce the invention to practice, without extensive research or experimentation."[45] In other words, even if the inventor has a complete mental picture of the invention's physical configuration, the invention is not "conceived" in patent law until the inventor has also determined how to make and use the invention in practice.[46]

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[42] Ariad Pharms., Inc. v. Eli Lilly & Co., 598 F.3d 1336, 1351 (Fed. Cir. 2010) (*en banc*); *see In re* Wertheim, 541 F.2d 257, 263 (C.C.P.A. 1976).

[43] Burroughs Wellcome v. Barr Labs., Inc., 40 F.3d 1223, 1227 (Fed. Cir. 1994).

[44] Townsend v. Smith, 36 F.2d 292, 295 (Ct. Cust. & Pat. App. 1930); Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1376 (Fed. Cir. 1986).

[45] *Burroughs Wellcome*, 40 F.3d at 1228; Hiatt v. Ziegler, 179 U.S.P.Q. 757, 763 (Bd. Pat. App. 1973). Reduction to practice means that the inventor actually creates the physical invention (if it is a product) or performs the steps of the invention (if it is a process). Alternatively, an inventor can constructively reduce an invention to practice by filing a valid patent application clearly describing how to make and use the invention. MPEP, *supra* note 12, § 2138.05.

[46] The Federal Circuit has held that conception requires both understanding the invention's structure and an operative method of making it. *See, e.g.*, Amgen, Inc. v. Chugai Pharm. Co., 927 F.2d 1200, 1206 (Fed. Cir. 1991). It would be more accurate to add that conception also requires understanding how to use the invention. The Patent Act requires that the invention be

Even when conception no longer defines the date at which the inventor is entitled to a patent, conception will still be necessary, because without it the applicant will lack the information necessary to complete the Section 112 disclosure.

Therefore, while Section 112 is indeed a procedural provision, one of its other functions is to provide evidence of whether the application's subject matter satisfies the substantive requirements of invention. As the Federal Circuit put it: "The conception analysis necessarily turns on the inventor's ability to describe his invention with particularity. Until he can do so, he cannot prove possession of the complete mental picture of the invention."[47] The relationship between the inventor's understanding and the physical configuration of the invention can be illustrated through an example:

{1a} Ira has processed several chemicals to create a novel and nonobvious compound through a complex series of steps. Ira believes the compound could prove to cure cancer, because its molecular structure is loosely related to the structures of other chemicals that have anticancer effects.

In example {1a}, Ira may be capable of fully describing how to make and use his new molecule, and so he can satisfy the procedural requisites of Section 112. However, if Ira's belief in the molecule's anticancer properties lacks any firm basis in science, the molecule does not satisfy the Section 101 utility requirement. Although under current law an inventor need not know with certainty or even probability that the invention will work for conception to be considered complete,[48] a mere wish or unsupported expectation does not suffice. In *Hitzeman*

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useful, 35 U.S.C. § 101. Although, as noted, the Federal Circuit interprets the Act *not* to require the inventor to know with confidence that the invention is useful, the Act clearly requires that the inventor disclose how to use the invention, assuming it does work. *See* 35 U.S.C. § 112 (2006). Therefore, conception of a product properly requires knowledge of: (1) the physical structure of the invention, (2) how to make the invention, and (3) how to use the invention. *Cf.* Space Systems/Loral, Inc. v. Lockheed Martin Corp., 271 F.3d 1076, 1080 (Fed. Cir. 2001) ("To be 'ready for patenting' the inventor must be able to prepare a patent application, that is, to provide an enabling disclosure as required by 35 U.S.C. § 112. . . . [If] the inventor himself [is] uncertain whether it could be made to work, a bare conception that has not been enabled is not a completed invention ready for patenting.").

[47] *Burroughs Wellcome*, 40 F.3d at 1228.

[48] *See, e.g., id.* ("[A]n inventor need not know that his invention will work for conception to be complete."); Cross v. Iizuka, 753 F.2d 1040, 1051 (Fed. Cir. 1985) (holding that *in vitro*

*v. Rutter*, the Federal Circuit held that a genetically-altered yeast intended to produce antigens having certain key size and sedimentation rates had not yet been conceived by the inventor, because the inventor had only a "hope," not a reasonable expectation, that the yeast would perform in that manner.[49] In Scenario {1a}, then, unless Ira has some scientifically sound basis, however partial, for attributing anti-cancer properties to his molecule, there is not (yet) a patentable invention.

Consider a slight alteration of example {1a}:

{1b} On January 30, Ilsa processes several chemicals to create a novel and nonobvious compound through a complex series of steps. At the time, she has no idea whether the chemical has any effective use. On June 1, she discovers that the new chemical is extremely effective at treating cancer. Ilsa files a patent application on the chemical.

Ilsa has clearly created the precursor to a new cancer-fighting drug, but when was it invented? On January 30 or June 1?

Example {1b} illustrates the subjective requirement of invention. A new product or process may meet the objective statutory patentability requirements (novelty, nonobviousness, and utility), but it is not a patentable "invention" until its creator appreciates the utility of the invention and understands how to reproduce it.[50] As a correlate, there have been cases in which the inventor created a new

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testing of a potential therapeutic compound, though far from establishing actual benefit to any person, suffices to show utility).

[49] Hitzeman v. Rutter, 243 F.3d 1345 (Fed. Cir. 2001).

[50] *See* Silvestri v. Grant, 496 F.2d 593, 596 (Ct. Cust. & Pat. App. 1974); Invitrogen, Corp. v. Clontech Labs., Inc., 429 F.3d 1052, 1064 (Fed. Cir. 2005) (holding that establishing conception requires evidence that the inventor understood the invention to have the features that comprise the inventive subject matter at issue). Chisum has also interpreted the Supreme Court jurisprudence to hold that "discovery of a practical utility is part of the act of inventing." DONALD CHISUM, CHISUM ON PATENTS § 2.02[5] (Rel. 110-9, 2007); *see also* Lentz, *supra* note 18, at 190 ("Thus, a person who conceives of or actually something, e.g., a new chemical entity, but who does not know of a use for the thing probably has not made a patentable invention and is not, therefore, an inventor unless and until a utility is discovered.").

The European Patent Office seems to interpret the European Patent Convention's requirement of "susceptibility to industrial application"—the parallel of the utility requirement—as integral to the concept of invention as well. *See* Michigan State U./Euthanasia Compositions,

chemical substance unwittingly; the substance was not deemed to have been conceived until the inventor perceived its presence,[51] because conception has not occurred until the inventor gains the ability to describe the invention.[52] In Example {1b}, conception occurred on June 1. Another variation illustrates a concomitant principle:

{1c} On January 30, Ian conceives of a chemical compound that he has sound scientific reason to believe will be extremely effective at treating cancer. However, he has no expertise in synthesizing this class of chemicals. On June 1, Rowena assists Ian to synthesize the compound using new insights and techniques developed specifically for the purpose.

Example {1c} is in some ways the reverse of {1b}. In {1b}, the first inventor could visualize and make the compound but did not know how to use it. In {1c}, the first inventor could visualize and knew how to use the compound, but did not know how to make it. The outcomes are equivalent; in both cases, the compound is not "invented" until June 1; in scenario {1c}, Ian and Rowena are joint inventors.[53]

The foregoing discussion, like any doctrinal restatement, gives an illusion of certainty about the law relating to invention. In practice, gray areas in the subjective prong of conception, coupled with frequent misunderstanding of the inventive process, plague the law and its application with inconsistencies. The explanation of example {1b} relies on the PTO's or court's ability to distinguish between sufficient and insufficient bases for attributing utility to the invention. From a scientific or engineering perspective, the question of whether an untested

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Eur. Pat. Off. Bd. App., Case No. T 0866/01, para. 4.6 (unrep. May 11, 2005), *available at* http://www.epo.org/law-practice/case-law-appeals/pdf/t010866eu1.pdf.

[51] *See, e.g.*, Langer v. Kaufman, 465 F.2d 915, 918 (C.C.P.A. 1972).

[52] *Burroughs Wellcome*, 40 F.3d at 1228.

[53] *See* Falana v. Kent State Univ., 669 F.3d 1349, 1358 (Fed. Cir. 2012) (holding that the putative inventor who envisioned the genus of compounds and contributed the method of making it contributes to the conception of that genus); *cf.* Bd. of Educ. *ex rel.* Bd. Of Trustees of Fla. State Univ. v. Am. Bioscience, Inc., 333 F.3d 1330, 1342 (Fed. Cir. 2003) (observing that, if some inventors conceived a chemical compound but were unable to make it without the help of another scientist, the assisting scientist might qualify as a coinventor); Fina Oil & Chem. Co. v. Ewen, 123 F.3d 1466, 1473 (Fed. Cir. 1997) ("Conception of a chemical substance requires knowledge of both the specific chemical structure of the compound and an operative method of making it.").

product or process will function as intended is not a "yes" or "no" one, but a sliding scale of probability. The Federal Circuit has adopted a murky test to determine where conception occurs on the scale between mere surmise and certainty of adequate functioning. For example, on one hand, in order to shift the burden of proof to the applicant, a PTO examiner challenging utility must produce evidence that a person having ordinary skill in the relevant art would reasonably doubt the alleged utility.[54] On the other hand, an applicant or patentee asserting the utility of a patented invention must produce at least some evidence, however inconclusive, that the invention works as intended.[55]

This leaves the PTO, which bears the burden of proving an absence of utility,[56] without much guidance. To be safe, the PTO has effectively adopted the practice of virtually never rejecting pharmaceutical inventions on utility grounds unless the allegation of utility is incredible.[57] This is partly because the PTO does not test the utility of an invention disclosed in a patent application and so must rely primarily on the applicant's representations and the (usually very general) background knowledge of the examiner. Such an "incredibility" test is inappropriate in judicial proceedings, where the party challenging the patent may introduce evidence of inutility that was unavailable to a PTO examiner. Yet, the Federal Circuit and its predecessor have endorsed an exceedingly low standard of evidence to uphold an allegation of utility, especially in the active field of pharmaceutical research.[58] Congealing the uncertainty is the jurisprudence,

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[54] *In re* Brana, 51 F.3d 1560. 1566 (Fed. Cir. 1995).

[55] *Id.*; *see also In re* '318 Patent Infringement Litig., 583 F.3d 1317, 1327 (Fed. Cir. 2009) ("Thus, at the end of the day, the specification, even read in the light of the knowledge of those skilled in the art, does no more than state a hypothesis and propose testing to determine the accuracy of that hypothesis. That is not sufficient."); Envirotech Corp. v. Al George, Inc., 730 F.2d 753, 762 (Fed. Cir. 1984) (holding that lack of utility is shown when there is a complete absence of data supporting the assertion of utility). *But see* Univ. of Pittsburgh v. Hedrick, 573 F.3d 1290, 1298 (Fed. Cir. 2009) ("An inventor need not know that his invention will work for conception to be complete . . . the discovery that the invention actually works is part of its reduction to practice.").

[56] *In re* Bundy, 642 F.2d 430, 433 (C.C.P.A. 1981).

[57] *See* MPEP, *supra* note 12, § 2107.01.

[58] *See, e.g.*, *Brana*, 51 F.3d at 1566-68 ("Usefulness in patent law, and in particular in the context of pharmaceutical inventions, necessarily includes the expectation of further research and development. The stage at which an invention in this field becomes useful is well before it is ready to be administered to humans."); Nelson v. Bowler, 626 F.2d 853, 856 (C.C.P.A 1980) (holding that inconclusive and statistically insignificant tests of the utility of a chemical

discussed in Part II.C, creating a strong legal presumption of validity of the patent despite a complete or nearly complete vacuum of information about whether the invention was in fact useful at the time the patent was examined and issued.

Another difficult doctrinal issue is raised in example {1b}. Suppose Ilsa did not discover the utility of the chemical; a new researcher, Ron, did. Does this not make Ron the inventor rather than Ilsa? Or does Ilsa remain the inventor? Or might they be considered joint inventors? From a logical and strictly doctrinal standpoint, the fact that conception was incomplete until Ron discovered the utility of the chemical implies that Ron is the sole inventor if he did not collaborate with Ilsa in any way, and a joint inventor with Ilsa if they did collaborate and Ron's discovery was more than a straightforward application of well-known principles of chemistry. However, as discussed in Part II.C, Federal Circuit and Supreme Court precedents have created a basis for doubting whether courts would actually endorse this outcome.

*2. The Role of the Claims*

The problematic patent law conception of invention arises in part from the role of the claims in defining the invention. The claims, as noted above, are the part of the patent document that delimits the outer boundaries of the invention for which the applicant seeks protection. They are typically one sentence long and terse, if not cryptic, in their phrasing. Partly because the claims are drafted by patent lawyers or agents rather than the inventor, and partly due to the organic idiosyncrasies of language, the claims may or may not encompass all of the invention. In fact, they may encompass quite a bit more than the invention.[59] A claim may encompass subject matter that the inventor never conceived and never could conceive. There is no *a priori* reason why the claims will completely overlap with the invention.

An inventor who claims *less* than the invention may lose some of the benefit of the invention. There are several reasons why this might happen. One is poor drafting, although the consequences of poor drafting to the hapless patentee are mitigated by the doctrine of equivalents and the possibility of broadening reissue

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compound were sufficient to establish utility); *In re* Gazave, 379 F.2d 973, 978 (C.C.P.A. 1967) ("[I]n the usual case where the mode of operation alleged can be readily understood and conforms to the known laws of physics and chemistry, operativeness is not questioned, and no further evidence is required.").

[59] Merges & Nelson, *supra* note 17.

proceedings.[60] Another possible reason is that the inventor wishes to commercially exploit only a subset of an invention's embodiments and to dedicate the remainder to the public.[61] In that case, patent coverage narrower than the invention as a whole poses no policy problems, because it is voluntary.

In contrast, an inventor who claims *more* than the invention risks the overbroad claims being invalidated.[62] When the claims exceed what was enabled in the written description, they fail to honor the basic patent bargain of disclosure of the invention in exchange for a legal monopoly over the claimed subject matter.[63] Patents with overbroad claims also fail to ensure that the inventor possessed the claimed subject matter, because there is no way to verify that the applicant did indeed invent what he cannot or will not describe. Indeed, such patents may suffer from a constitutional deficiency on the theory that Congress has no power to grant patents on subject matter the inventor did not invent.[64]

Probably the most famous example of an inventor who tried to claim far more than he invented relates to the Morse telegraph.[65] Morse, recognized as the inventor of the electro-magnetic telegraph, obtained a reissue patent with eight claims. The first seven claimed various uncontroversial components and embodiments of the electric telegraph. The eighth claim, however, covered much broader subject matter:

> I do not propose to limit myself to the specific machinery or parts of machinery described in the foregoing specifications and claims; the essence of my invention being the use of the motive power of the electric or galvanic current, which I call electro-magnetism, however developed for marking or printing intelligible characters, signs, or

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[60] On reissue proceedings, see 35 U.S.C. § 251 (2006); *see generally* 37 C.F.R. § 1.176.

[61] Any part of the invention disclosed in the specification but not claimed is deemed dedicated to the public. *See* Maxwell v. J. Baker, Inc., 86 F.3d 1098, 1106 (Fed. Cir. 1996). For an interesting exploration of this issue, *see generally* Robert A. Migliorini, *The Dedication to the Public Doctrine and Lessons for Patent Practitioners*, 87 J. PAT. & TRADEMARK OFF. SOC'Y 825 (2005).

[62] *See* O'Reilly v. Morse, 56 U.S. (15 How.) 62 (1853).

[63] *See* sources cited *supra* note 10.

[64] *See* U.S. CONST. art. I, § 8, cl. 8.

[65] *Morse*, 56 U.S. (15 How.) at 62.

> letters, at any distances, being a new application of that power of which I claim to be the first inventor or discoverer.[66]

The Supreme Court struck the claim as overbroad, because it covered subject matter that Morse had not described in his patent "and indeed had not invented."[67]

> Professor Morse has not discovered, that the electric or galvanic current will always print at a distance, no matter what may be the form of the machinery or mechanical contrivances through which it passes. You may use electro-magnetism as a motive power, and yet not produce the described effect, that is, print at a distance intelligible marks or signs. To produce that effect, it must be combined with, and passed through, and operate upon, certain complicated and delicate machinery, adjusted and arranged upon philosophical principles, and prepared by the highest mechanical skill. And it is the high praise of Professor Morse, that he has been able, by a new combination of known powers, of which electro-magnetism is one, to discover a method by which intelligible marks or signs may be printed at a distance. And for the method or process thus discovered, he is entitled to a patent. But he has not discovered that the electro-magnetic current, used as motive power, in any other method, and with any other combination, will do as well.[68]

If the claim had been upheld, Morse could prevent another inventor who had developed an entirely different and potentially better means of using electricity to transmit information for printing at a distance (for instance, by wireless radio frequency transmitter and receiver) from practicing his patent. The Court accordingly rejected the claim.

The *Morse* case illustrates the interdependence of the Section 112 disclosure requirement and the concept of invention. The Court's reasoning implied that the disclosure requirement does not only alert the public to the parameters of the protected intellectual property and teach the public how to make and use the invention, but tailors the scope of patent protection to what the inventor actually

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[66] *Id.* at 112.
[67] *Id.* at 113.
[68] *Id.* at 117.

contributed to the technological field.[69] When the applicant claims more than he invented, the benefits of the patent to the public are attenuated and the possibility of a dysfunctional patent precedent arises.

Patent prosecutors are typically more concerned about underclaiming than overclaiming. The patent examiner frequently whittles down an overly aggressive claim, and those exaggerated claims that survive prosecution will benefit from a strong presumption of validity, which gives the patentee useful leverage for negotiating with licensees and competitors, even if the claims are not strictly enforceable under a proper interpretation of the claim. At worst, the patentee can obtain a narrowing reissue a few years down the road to ensure the claim's enforceability.[70] An overly narrow claim, in contrast, risks dedicating the unclaimed subject matter to the public for all time. It is possible to seek a broadening reissue, but only within two years after the patent is granted.[71] As a result, many patent prosecutors tend toward aggressively claiming more than the inventor actually conceived, so long as the overclaiming will not court rejection by the PTO examiner.

The claims are important, but as the Federal Circuit has emphasized *en banc*, not all-important: "The claims . . . do not stand alone. Rather, they are part of 'a fully integrated written instrument'" (i.e., the patent).[72] Yet, when not engaged in the narrow task of claim construction, courts have sometimes fetishized the claims as if they were the only legally material part of the patent. The importance of the claims in determining whether anticipation by prior art or patent infringement has occurred has led many courts, including the Supreme Court, to use language that conflates the claims with the invention itself: the claims, they assert, "define the invention."[73] The Federal Circuit has stated that a researcher must "conceive" of a

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[69] *See id.*

[70] *See* 35 U.S.C. § 251 (2006).

[71] *Id.*

[72] Phillips v. AWH Corp., 415 F.3d 1303, 1315 (Fed. Cir. 2005) (*en banc*) (quoting Markman v. Westview Instruments, Inc., 52 F.3d 967, 978 (Fed. Cir. 1995)); *see also* United States v. Adams, 383 U.S. 39, 49 (1966).

[73] *See, e.g.*, Altoona Publix Theatres, Inc. v. American Tri-Ergon Corp., 294 U.S. 477, 487 (1935); Purdue Pharma L.P. v. Endo Pharm. Inc., 438 F.3d 1123, 1136 (Fed. Cir. 2006) ("[I]t is the claims ultimately that define the invention."); Netscape Commc'ns Corp. v. Konrad, 295 F.3d 1315, 1323 (Fed. Cir. 2002) ("However, it is the claims that define a patented invention.").

"claim" (rather than an invention) to be an inventor,[74] and suggested that Section 116 of the Patent Act requires a coinventor to "make a contribution to the conception of the subject matter of a claim."[75]

The Patent Act says no such thing; it formerly referred to inventions and "subject matter" rather than claims, and now refers to these and to the "claimed invention" as well. Claims may or may not coincide with the full scope of the invention or even the "claimed invention." Oskar Liivak has defined the invention as "the set of all of the embodiments that the inventor has invented. That is, the invention is the set of embodiments conceived by the inventor in enough detail so that each of those embodiments is capable of being reduced to practice."[76] This definition, while incomplete, has the virtue of indicating how the invention is (or at least should be) more expansive than the claims, which are "written attempts to circumscribe varying subsets of the embodiments disclosed in the specification."[77] Liivak's point, that the claims (and indeed the "claimed invention" of Section 100(j)) are a *subset* of the invention rather than the invention itself, is well taken. Courts have on a few occasions distinguished explicitly between the aspects of the invention protected by patent and the invention as a whole. For example, in a moment of clarity, a panel of the Federal Circuit observed that "the specification teaches an invention, whereas the claims define the right to exclude."[78] The Supreme Court has also distinguished between the two, stating that claims are "construed . . . with a view to ascertaining the invention."[79]

The necessity of distinguishing between the claims and the invention to which the claims pertain is also evident from the Patent Cooperation Treaty (PCT), to which the United States is a party.[80] The PCT allows inventors to file a single patent application that may result in patents in multiple countries. Under the "unity of invention" requirement, the patent application must relate to just one

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[74] Univ. of Pittsburgh v. Hedrick, 573 F.3d 1290, 1297-98 (Fed. Cir. 2009); *see also* Ethicon, Inc. v. U.S. Surgical Corp., 135 F.3d 1456, 1460 (Fed. Cir. 1998) ("[T]he critical question for joint conception is who conceived, as that term is used in the patent law, the subject matter *of the claims at issue*.") (emphasis added).

[75] Eli Lilly & Co. v. Aradigm Corp., 376 F.3d 1352, 1361-62 (Fed. Cir. 2004).

[76] *See* Liivak, *supra* note 15.

[77] *Id.*

[78] Univ. of Rochester v. G.D. Searle & Co., 375 F.3d 1303, 1306 (Fed. Cir. 2004).

[79] United States v. Adams, 383 U.S. 39, 49 (1966).

[80] Patent Cooperation Treaty, *done on* June 19, 1970, 28 U.S.T. 7645, 1160 U.N.T.S. 231, *available at* http://www.wipo.int/pct/en/texts/articles/atoc.htm [hereinafter PCT].

"invention" or a "group of inventions so linked as to form a single general inventive concept."[81] Yet, in each state granting a patent resulting from the PCT application, the claims may differ to comply with local filing requirements.[82] A single invention could not receive the same patent protection in different countries using different claims unless the invention is something larger than the claims.

The frequent judicial and scholarly statements that claims "define" the invention, then, are misleading.[83] The invention is more than the claims; the claims limit the invention but they do not alone define it. "[I]t is fundamental that claims are to be construed in the light of the specifications and both are to be read with a view to ascertaining the invention."[84] The written description portion of the specification "'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.'"[85] If the claims must always be read in light of the specification, the claims cannot "define" the invention; they merely limit the extent to which the patent protects the invention.

The Leahy-Smith America Invents Act, the relevant provisions of which take effect on March 16, 2013, suggests that Congress shares this perception of the distinction between the claims and invention. The Section 102 amendments substitute the term "invention" in the novelty provisions of the Patent Act with the term "claimed invention,"[86] which is in turn defined as "the subject matter defined

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[81] *See* i*d.* arts. 2(i), 3(4)(iii), 17(3). *See also* Paris Convention for the Protection of Industrial Property art. 4(G), *done on* July 14, 1967, 21 U.S.T. 1583, 828 U.N.T.S. 305, *available at* http://www.wipo.int/treaties/en/ip/paris/trtdocs_wo020.html (establishing unity of invention requirement for priority patent applications).

[82] *See* PCT, *supra* note 80, art. 28.

[83] *See, e.g.*, Sjoland v. Musland, 847 F.2d 1573, 1582 (Fed. Cir. 1988) (noting that claims define the invention); Mark J. Stewart, *The Written Description Requirement of 35 U.S.C. § 112(1): The Standard After* Regents of The University of California v. Eli Lilly & Co., 32 IND. L. REV. 537, 541 (1998-1999).

[84] *Adams*, 383 U.S. at 49.

[85] Phillips v. AWH Corp., 415 F.3d 1303, 1315 (Fed. Cir. 2005) (*en banc*) (quoting Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996)).

[86] America Invents Act, *supra* note 3, § 3, *to be codified as* 35 U.S.C. § 102.

by a claim in a patent or an application for a patent."[87] From this, it appears that Congress considers the "invention" to be different from the "claimed invention."[88]

Because the patent protects only the claimed portion of an invention from infringement, it is possible to infringe on a "claim," but not an "invention." By extension,[89] prior art may anticipate specific claims in a patent application without rendering the invention unpatentable. Section 102 now more clearly suggests that novelty analysis consists in determining whether specific claims are anticipated by prior art, as opposed to analyzing whether the "invention" as a whole is anticipated by prior art, because each claim stands on its own. It follows that a person who infringes any one claim infringes the patent, even if the accused product or process does not infringe any other claim.

For both anticipation and infringement purposes, then, claims do not "define" the invention in the conventional sense; they define the rough outlines of what part of the invention can overcome anticipatory prior art and accordingly what part of the invention the patent protects from infringement. This key distinction between the invention and the claims has unappreciated importance for determinations of inventorship, and especially of joint inventorship.

### *B. Inventorship and Joint Inventorship*

#### *1. The Evolved Doctrine*

When a sole researcher conceives the entirety of an invention, she must satisfy all of the patentability requirements by herself. When the inventor fulfills these requirements, abstruse doctrinal or policy problems arise only in exceptional cases. But the image of the lone scientist confined to a laboratory for months, and ultimately emerging with a triumphant new invention has more romantic appeal than correspondence with reality. Although much government rhetoric exalts the

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[87] *Id., to be codified as* 35 U.S.C. § 101(i).

[88] Technically, to avoid an internal contradiction in the Patent Act, Congress should have amended Section 112 to say: "the subject matter for which the applicant seeks patent protection." As the AIA amends the Patent Act, what the inventor "regards as his invention" is irrelevant; what matters are the aspects of the invention for which the applicant seeks and can obtain patent protection.

[89] *See* Peters v. Active Mfg. Co., 129 U.S. 530, 537 (1889) ("That which infringes if later anticipates if earlier.").

independent inventor,[90] in modern industry, discoveries in applied science are usually a product of teamwork. Joint invention is now more common than sole invention.[91] In general, a joint invention "is the product of a collaboration between two or more persons working together to solve the problem addressed."[92] Yet, the process of identifying whether a collaborator qualifies as a joint inventor was until very recently crude and uncertain, and even today the law remains underdeveloped.

Before 1984, the Patent Act's provisions on joint inventorship were entirely procedural; they offered no guidance to the judiciary on how joint inventorship should be understood. The Act merely stated: "When an invention is made by two or more persons jointly, they shall apply for patent jointly and each sign the application and make the required oath, except as otherwise provided in this title."[93] It then went on to explain what procedural measures could be taken if a joint inventor refused to join in the application, as well as the consequences of a non-inventor being wrongly listed as an inventor (commonly known as "misjoinder") or an inventor being erroneously omitted ("nonjoinder").[94]

For many years, courts struggled with the question of how to determine who was a joint inventor. Regarding the threshold of contribution required to qualify as a joint inventor, their formulated tests were frequently vague and sometimes contradictory, leading one district court judge to lament:

> 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. . . . 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. . . .

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[90] *See* Mark Janis, *Patent Abolitionism*, 17 BERKELEY TECH. L.J. 899, 910-20 (2002) (describing governmental statements and policies paying homage to the "independent inventor").

[91] *See* Stefan Wuchty, Benjamin F. Jones & Brian Uzzi, *The Increasing Dominance of Teams in Production of Knowledge*, 316 SCIENCE 1036, 1036-37 (2007); Dennis D. Crouch & Jason Rantenen, *The Changing Nature* [sic] *Inventing: Collaborative Inventing*, PATENTLY-O BLOG (July 9, 2009, 9:28 AM), *at* http://www.patentlyo.com/patent/2009/07/the-changing-nature-inventing-collaborative-inventing.html.

[92] Burroughs Wellcome Co. v. Barr Labs., Inc., 40 F.3d 1223, 1227 (Fed. Cir. 1994).

[93] Act July 19, 1952, ch. 950, § 116, 66 Stat. 792 (codified at 35 U.S.C. § 116 (1952)).

[94] *Id.*

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> . . . . This situation does make it difficult to say . . . with real certainty, whether or not a given person "is" a joint inventor in a given case.[95]

Such guidance was indeed lean. "Less something of benefit" is rather overinclusive as a standard; it would reward routine, and indeed flatly obvious, contributions with coinventorship. Courts were plainly struggling with the doctrine. Another judge wrote:

> The conception of the entire device may be due to one [inventor], but if the other makes suggestions of practical value, which assisted in working out the main idea and making it operative, or contributes an independent part of the entire invention, which is united with the parts produced by the other and creates the whole, he is a joint inventor, even though his contribution be of comparatively minor importance and merely the application of an old idea.[96]

These pronouncements were problematic not only because of their lack of guidance. The mere contribution of "an old idea" of "minor importance" is probably too low a standard, and has been at least called into doubt by Federal Circuit precedent.[97] If a joint inventor must contribute something nonobvious, then the nature of the contribution determines joint inventorship, not merely the effect of the contribution on the invention's functioning. It would seem that a collaborator who contributed nothing more than information or designs well known in the art would not qualify as an inventor unless the application of that prior art to the problem at hand would have been nonobvious.[98] A decided

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[95] Mueller Brass Co. v. Reading Indus., 352 F. Supp. 1357, 1372-73 (E.D. Pa. 1972), *aff'd*, 487 F.2d 1395 (3d Cir. 1973). The reason for the quotation marks around "is" is unclear. *See also* Jamesbury Corp. v. United States, 518 F.2d 1384, 1396 (U.S. Ct. Cl. 1975) (commenting on "[t]he difficulty . . . in attempting to define a standard to be used to determine who is a joint inventor and the type of contribution that is necessary to qualify as a coinventor . . . .").

[96] De Laski & Thropp Circular Woven Tire Co. v. Williamm R. Thropp & Sons Co., 218 F. 458, 464 (D.N.J. 1914), *aff'd*, 226 F. 941 (3d Cir. 1915).

[97] *Cf.* Hess v. Advanced Cardiovascular Sys., Inc., 106 F.3d 976, 981 (Fed. Cir. 1997).

[98] The timing of the supply of information or ideas by the collaborator determines whether it qualifies as a contribution to conception for purposes of establishing joint inventorship. Specifically, a not insignificant contribution to conception establishes joint inventorship if the contribution was not in the prior art at the time contributed. If the contribution entered the public

improvement in the functioning of the invention is relevant to assessing the quality of the contribution but far from dispositive.

While the historical standard of joint inventorship might have seemed low, in some ways it compensated for an aberration of patent law that discouraged team research. In case after case, federal courts denied joint inventors the right to file a single patent with multiple claims on the product of their collaboration, if all inventors did not contribute to each and every claim.[99] In other words, this "all claims rule" excluded from inventorship any collaborator who did not contribute to every claim of the patent. As a leading treatise of the time put it: "Only where the same single, unitary idea of means is the product of two or more minds, working *pari passu*, and in communication with each other, is the conception truly joint and the result a joint invention."[100] One nineteenth century court even held that when two researchers invent distinct parts of the same new machine, they should obtain separate patents as sole inventors on each part of the machine rather than a single patent as coinventors on the machine as a whole.[101]

In 1967, a federal trial court cleared up much of the doctrinal obscurity and tried to reverse the bias against collaborative research. *Monsanto v. Kamp Co.* arose from an interference proceeding before the U.S. Patent Office, predecessor to the PTO.[102] The invention in question was a specially coated plastic container for pharmaceuticals.[103] The plaintiffs challenged the designation of two defendants as

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domain later, after its contribution to the research team but before the team files a patent application, it qualifies the contributor as an inventor. As the Federal Circuit has explained: "Contributions to realizing an invention may not amount to contribution to conception if they merely explain what was '*then* state of the art.'" Eli Lilly & Co. v. Aradigm Corp., 376 F.3d 1352, 1359 (Fed. Cir. 2004) (quoting *Hess*, 106 F.3d, at 981)(emphasis added). The Patent Act, as amended by the AIA, provides explicitly that an invention does not necessarily sacrifice patentability merely by public exposure. *See* 35 U.S.C. § 102(b)(1) (2013) (requiring that disclosures by the inventor (or derived from the inventor) do not constitute a bar to patentability unless made one year prior to the effective filing date of the patent application). The same is true *a fortiori* for a contribution to conception of a patentable invention, because the contribution assisted in the final conception regardless of whether it later became public knowledge.

[99] For a review of the case law interpreting joint inventorship before 1984, see generally John O. Tresansky, *Joint Invention*, 7 AIPLA Q.J. 96 (1979).

[100] 1 WILLIAM C. ROBINSON, THE LAW OF PATENTS FOR USEFUL INVENTIONS § 396 (1890).

[101] Worden v. Fisher, 11 F. 505, 508-09 (E.D. Mich. 1882).

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

[103] *Id.*

joint inventors, which launched the court into an original discussion of the principles of joint invention:

> 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.[104]

The district court decision in *Kamp* was (and is) cited with some frequency by other courts, including the Federal Circuit.[105]

Although *Kamp* stood as a beacon of thoughtful interpretation, a district court decision could not unify patent doctrine nationwide. Eventually, Congress had to clarify the standards of joint invention. This took the form of the 1984 Patent Law Amendments Act (PLAA), which added the following language to what is now Section 116(a):

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

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[104] *Id*. at 824.

[105] Cited 158 times as of this printing. *See, e.g.*, Vanderbilt University v. Icos Corp., 601 F.3d 1297, 1302 (Fed. Cir. 2010); Hyatt v. Doll, 576 F.3d 1246, 1271 (Fed. Cir. 2009). Cited in the MPEP as well, *supra* note 12, § 605.07.

> 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.[106]

This language has not been altered since and remains the main Patent Act provision defining the conditions for joint inventorship.

The 1984 PLAA reversed the all claims rule, allowing a research team to apply for a single patent on a unitary inventive concept despite the fact that some team members may have contributed to only a single claim in a multiple claim patent. It also codified the trend advanced by the *Kamp* decision toward relaxing the standard of collaborative invention. It is now clear that direct interaction between or among collaborators is unnecessary. For example, consider the following scenario:

{2} Three scientists, Alpha, Beta, and Gamma, are involved in research calculated to lead to the discovery of a room-temperature superconducting material. Alpha is involved throughout the entire project, which takes a total of ten years before an invention has been conceived and is ready for patenting, but Alpha's contribution, although of an inventive quality, is relatively minor. Quantitatively, Alpha's contribution of effort, expertise, and creative thinking amounts to about 10% of all the effort, expertise, and creative thinking that went into the invention. Beta was involved from the beginning as well, but after nine years and six months, quit the project. Beta's contribution was, however, overwhelming, accounting for 80% of the research effort, etc. During the last six months, Gamma became involved in the project and collaborated with Alpha to finalize the conception of the invention. Due to Gamma's late arrival, Gamma contributed only 10% to the project. Beta and Gamma never directly communicated with one another; Gamma merely took up Beta's almost-completed work.

In scenario {2}, a requirement of direct collaboration at the time the invention was completed would make Alpha and Gamma joint inventors, but not Beta, despite the fact that Beta individually contributed much more than the other two inventors combined. This result is not only unfair to Beta, it creates a

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[106] Patent Law Amendments Act of 1984, Pub. L. 98-622, § 104, 98 Stat. 3385 (current version at 35 U.S.C. § 116 (2006)).

powerful disincentive to collaborate in applied research, because, except in the rare situation that the research is certain to result in the successful development of a valuable invention in short order, a researcher's contribution could be wasted if the researcher needs to leave the collaboration before a patentable result is produced. Many such reasons would be beyond the control of the collaborator, such as illness, financial distress during extended research, termination of employment with an employer sponsoring the research, and so forth. The PLAA establishes beyond peradventure that Beta is as much an inventor as his collaborators.

Similarly, the PLAA suggests that in assessing inventorship in scenario {1b} above, if Ron rather than Ilsa discovered the utility of Ilsa's compound, Ron would be a coinventor. Before the PLAA, courts could deny the importance of Ron's inventive contribution. For example, in *Eli Lilly & Co. v. Premo Pharmaceutical Laboratories, Inc.*, two scientists had synthesized a compound (cephalexin) in "the hope that the resulting compound would be [an] effective oral antibiotic" for certain biochemical reasons.[107] A third scientist tested the compound and found that it was indeed an effective oral antibiotic for entirely different biochemical reasons than the first two scientists had guessed. The patent on the compound, however, listed only the first two scientists as inventors. When an accused infringer challenged the validity of the patent for nonjoinder, the Third Circuit held that the third scientist's discovery of the invention's "nonobvious trait" did not qualify him as a joint inventor of the compound. In attempting to justify this result, the court wrote:

> it is without question that the named inventors, Drs. Morin and Jackson, were the only persons who performed the synthesis that created the patented product. In the words of § 116, cephalexin was 'made by' the two named inventors, not by the biochemist who first noted that the organic chemists' predictions had been realized.[108]

After the PLAA, this result even less plausible than before. A compound whose utility or nonobvious traits are unknown has not yet been "conceived" as an invention under the patent law.[109] A collaborator who makes a significant, original contribution to conception, such as by discovering utility or the nonobvious trait, is

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[107] Eli Lilly & Co. v. Premo Pharma. Labs., Inc., 630 F.2d 120, 135 (3d Cir. 1980).
[108] *Id.*
[109] *See supra* text accompanying note 46.

a coinventor even if his contribution was different in type (testing of the compound versus synthesis of the compound) from that of his collaborators.[110]

With regard to the level and kind of contribution required of a joint inventor, the PLAA added relatively little.[111] Instead, the newly organized Federal Circuit developed joint inventorship analysis in its jurisprudence—a jurisprudence that continues to dominate discussions of inventorship today.[112] Beginning in the early 1990s, the court decided a series of cases that delineated the basic substantive contours of joint inventorship.[113] For the most part, these did not radically depart from the main body of cases decided before the PLAA. Before the amendment, the concept of joint inventorship was rarely interpreted to require "give-and-take" between or among joint inventors. In a 1980 case, for example, a Florida district court found that when one researcher developed a prototype of the invention and passed the prototype to a second researcher, who perfected it, they were joint inventors despite the lack of any regular communication between them. "The ideas" of the first inventor "were presented daily" to the second "by the prototype, and the final result was a creation that exceeded the results of either inventor," the

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[110] This is a point well explained by Edward Lentz:

> [A] person who conceives of or actually makes something, e.g., a new chemical entity, but who does not know of a use for the thing probably has not made a patentable invention and is not, therefore, an inventor unless and until a utility is discovered. At that time, a patentable invention will have been made and the person who conceived of the utility is probably a joint inventor with the person who conceived the thing.
>
> In some cases, the novelty of an invention is not appreciated by the person who conceives of the invention but rather is discovered subsequently. In these cases, conception of the invention is not complete until the novelty is appreciated.

Lentz, *supra* note 18, at 190.

[111] *Cf.* Burroughs Wellcome Co. v. Barr Labs., Inc., 40 F.3d 1223, 1227 (Fed. Cir. 1994) ("The statute does not set forth the minimum quality or quantity of contribution required for joint inventorship.").

[112] In the 2011 America Invents Act, Congress adopted the first formal definition of a "joint inventor" or "coinventor," meaning "any 1 of the individuals who invented or discovered the subject matter of a joint invention." 35 U.S.C. § 100(g) (2012). As with the definition of "inventor," this amendment does little beyond present a tautology and the mysterious additional concept of "subject matter" of an invention.

[113] Kimberly-Clark Corp. v. Procter & Gamble Distrib. Co., 973 F.2d 911 (Fed. Cir. 1992).

court observed.[114] The court understood that, although collaboration always requires communication between the collaborators, communication can take nonverbal as well as verbal forms. There is no policy reason to prioritize verbal over nonverbal collaboration if both forms can accelerate technological development. The Federal Circuit continued this interpretation of joint inventorship law; so long as the inventors were consciously cooperating, one collaborator may simply read and build upon a report written by another, or profit from the suggestion of another at a meeting, to qualify them as joint inventors.[115]

More importantly, the Federal Circuit unified and fleshed out the kind of contribution necessary to qualify a collaborator as a joint inventor. From *Pannu v. Iolab*,[116] three general conditions may be deduced. First, the alleged coinventor must contribute to the conception of the invention.[117] Second, his contribution to the invention must not be insignificant in quality, when measured against the dimension of the full invention.[118] Third, the contributor must do more than merely explain to the real inventors well-known concepts or the current state of the art.[119]

The second and third conditions follow in a sense from the first. The alleged joint inventor's contribution could not merely relate the state of the art to the collaborators, because providing well-known information "is not a contribution to conception."[120] One does not invent merely by repeating public information or using ordinary skills; the contribution must go beyond well-known prior art. Similarly, non-technical contributions to the invention, such as suggesting a desirable goal of research (unless identifying that goal is technically difficult and

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[114] Clairol Inc. v. Save-Way Indus., 210 U.S.P.Q. 459, 465 (S.D. Fla. 1980).

[115] *Kimberly-Clark Corp.*, 973 F.2d at 915-17; *see also* Arbitron, Inc. v. Kiefl, No. 09-CV-04013, 2010 U.S. Dist. LEXIS 83597, at *16-17 (S.D.N.Y., Aug. 13, 2010) (holding that one scientist who reviewed and built on a report about another's discovery collaborated sufficiently to qualify as joint inventors).

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

[117] *Id.* at 1351.

[118] *Id.*

[119] *Id.*

[120] Eli Lilly & Co. v. Aradigm Corp., 376 F.3d 1352, 1362 (Fed. Cir. 2004); *Pannu*, 155 F.3d at 1351.

not obvious) and providing management or financing, are not contributions to conception.[121]

The Federal Circuit has repeatedly observed that Section 116 of the Patent Act "sets no explicit lower limit on the quantum or quality of inventive contribution required for a person to qualify as a joint inventor."[122] However, the court has interpreted Section 116 to impose a second condition on the alleged joint inventor—that his contribution must be "not insignificant in quality, when that contribution is measured against the dimension of the full invention."[123] Where to draw the line of significance on the scale between a critical contribution and a trivial one is a tricky and highly subjective exercise. Unfortunately, the case law interpreting significance remains notably thin.

In one unpublished case, the U.S. Court of Appeals for the Fourth Circuit interpreted the significance factor to require that all joint inventors contribute to the specific aspect of the invention that made it patentable. In *Levin v. Septodont*, the developer of a new numbing cream to treat mouth ulcers, Dr. Kilday, was approached by a retired dentist, Dr. Levin, who had the idea of developing a numbing mouth rinse to reduce pain caused by routine dental procedures.[124] Working together, Kilday and Levin determined that the active ingredients in the rinse should be the antiseptic phenol and the anesthetic benzocaine.[125] Kilday determined the proportion of ingredients in the product.[126] However, Kilday also recognized that these ingredients could not be dissolved in an alcohol solution due to the burning sensation caused by alcohol. Kilday therefore approached Eastman Chemical to help develop a suitable suspension solution. After significant research, Eastman developed a new solution composed of a combination of polyethylene glycol and propylene glycol that solved the burning problem.[127]

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[121] *See generally* Robert W. Harris, *Conceptual Specificity as a Factor in Determination of Inventorship*, 67 J. PAT. & TRADEMARK OFF. SOC'Y 315 (1985) (discussing the kinds of contributions to invention that do not rise to the level of contributions to conception due to lack of sufficient specificity).

[122] Fina Oil & Chem. Co. v. Ewen, 123 F.3d 1466, 1473 (Fed. Cir. 1997); *Aradigm Corp.*, 376 F.3d at 1358.

[123] *Fina Oil & Chem.*, 123 F.3d at 1473; *Pannu*, 155 F.3d at 1351.

[124] Levin v. Septodont, Inc., 34 Fed. Appx. 65 (4th Cir. 2002).

[125] *Id.* at 67.

[126] *Id.* at 70.

[127] *Id.* at 67.

Eastman sought a patent on the resulting dental mouth rinse, but named only its employees, and not Kilday.[128]

Septodont sought to correct the patent by joining Kilday as a coinventor. Levin resisted on the ground that the PTO examiner had opposed the patent application as obvious until a limitation was added specifically claiming the Eastman suspension solution. The court sided with Levin, interpreting joint inventorship doctrine to require contribution to the novel and nonobvious limitations of the claim—indeed, regardless of whether a specific collaborator's contribution appears in the claims or indeed is the defining feature of the invention.[129] In other words, the Fourth Circuit would have interpreted an inventive contribution's "significance" in light of its novelty and nonobviousness.

*Levin v. Septodont* is not a precedential opinion,[130] but it illustrates a troubling misunderstanding of the concept of joint invention. The court effectively held that the collaborators who conceived the invention as a whole, determined its utility, and chose key ingredients and their proportions did not contribute significantly to conception. The problem arises from the Fourth Circuit's dissection of the invention. The invention as a whole was novel and nonobvious—an anesthetic mouth rinse for routine dentistry—and it was conceived by Levin, Kilday, and Eastman scientists in collaboration. A collaborator's contribution need not define the nonobvious aspect of the invention itself, so long as it satisfies the three *Pannu* conditions. No doubt the Eastman collaborators were inventors as well, given their contribution to an important and nonobvious aspect of the invention. Possibly their suspension solution was independently patentable, and in that case the Eastman scientists would stand alone as inventors of the solution. But the patent claimed not the solution itself but rather an "anesthetic and antiseptic mouth rinse" using a non-alcohol solution.[131] Simply put, the invention before the court would have been impossible without Levin and Kilday's original

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[128] *Id.*

[129] *Id.* at 71-73.

[130] *Id.* at 67. Aside from the fact that the opinion was not selected for publication, the Fourth Circuit cannot bind the Federal Circuit. Normally, this issue would have been decided by the Federal Circuit, but the case was not primarily an infringement action, but rather a breach of contract action. 28 U.S.C. § 1295(a)(1) (2006) (noting that the Federal Circuit shall have exclusive jurisdiction from the appeal of a final decision of a district court in any civil action arising under, or in any civil action in which a party has asserted a compulsory counterclaim arising under, any Act of Congress relating to patents or plant variety protection.)

[131] U.S. Patent No. 5,547,657 (filed Oct. 11, 1994).

contributions. In denying them status as coinventors, the Fourth Circuit not only deprived a valuable collaborator of the patent reward, but conferred that reward on Eastman for novel and nonobvious ideas that Eastman did not develop and probably could not have developed itself.

It is probably fair to say that any contribution adding the novel, nonobvious, or useful element to the invention is *ipso facto* significant. To conclude from this, however, that any *other* contribution is insignificant is a *non sequitur*. The question of what kind of contribution does qualify as significant—a question the Federal Circuit has not had occasion to answer in great detail—remains open. Presumably, such factors as whether the collaborator:

- identified or solved a problem unrecognized by the others;
- solved a problem that other collaborators could not solve;
- added a nontrivial advantage to the invention that the other collaborators did not contemplate; or
- contributed the novel, nonobvious, or useful aspect of the invention or a nontrivial part of it

would weigh heavily in favor of finding an inventive contribution "not insignificant" if directed to any functional aspect of the invention.[132] The contributor's skill set and abilities relative to other collaborators may have some bearing on whether these criteria are satisfied. The kind and level of expertise of the collaborator, his effort expended relative to other collaborators, and the importance and originality of his insight to the advantages of the invention, would all be relevant as well.[133]

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[132] The patent laws of most countries, like that of the United States, are underdeveloped in defining who qualifies as a joint inventor. For example, Canadian, German, and Japanese patent laws are all vague on the concept of joint inventorship. *See, e.g.*, Motorkettensäge Case, Fed. Ct. Just. (Bundesgerichtshof) Decision of June 20, 1979 (Fed. Rep. of Ger.) (contributions that have not influenced the overall success of the invention or solved any significant problem do not support coinventorship). However, some offer more guidance than others. The first three of the factors listed in the text are used by Australian courts in determining the "material effect" of the collaborator's contribution. *See Row Weeder Pty., Ltd. v Nielsen*, (1997) 39 IPR 400 (Austl.).

[133] *Cf., e.g.*, Rhone-Poulenc Agro, S.A. v. Monsanto Co., 445 F. Supp. 2d 531, 548 (M.D.N.C. 2006) (expertise); Ethicon Inc. v. U.S. Surgical Corp., 135 F.3d 1456, 1460 (Fed. Cir. 1998) (skills possessed by one inventor and not the other).

The consequences of designating too many or too few collaborators as inventors on a patent application may be trivial or (much more rarely) fatal, depending on the provable intent of the applicants. Misjoinder or nonjoinder of joint inventors is supposed to invalidate a patent if done intentionally, but an accused infringer cannot realistically be expected to produce clear and convincing evidence of the applicant's state of mind in most cases. As a result, successfully proving misjoinder or nonjoinder usually results in a correction of inventors in order to save the patent from invalidity.[134]

*2. The Distorting Effect of Claims Fixation*

The joint inventorship doctrine described in *Pannu v. Iolab* is sound as far as it goes. It meshes with both the constitutional limitations on the congressional patent power and the language and policy purposes of the Patent Act. The problem is not in the general standard of joint inventorship, but in its implementation. The Federal Circuit has sometimes diverted the inquiry away from a fact-intensive examination of the realities of the inventive process into a rigidly formulaic test, with the regrettable result of facilitating mistaken or fraudulent nonjoinder.

The judicial decisions carrying the greatest potential to warp inventorship standards probably are not substantive, but procedural. This relates back to the manner in which courts have confused the claims with the invention. The Constitution and Patent Act refer to inventors and their inventions, but as noted, courts have frequently written the invention out of patent law and substituted the claims, so that, for example, an inventor in the Federal Circuit's jurisprudence does not conceive an invention, but rather a "claim,"[135] and a coinventor must contribute not to the conception of the invention, but to the conception of "the subject matter of a claim."[136]

The standard procedure developed by the Federal Circuit for evaluating joint inventorship was explained in *Trovan, Ltd. v. Sokymat S.A. Irori*.[137] There, the court equated inventorship analysis to infringement analysis.[138] Infringement analysis begins with a binding interpretation of the claims through a *Markman*

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[134] 35 U.S.C. §§ 116, 256 (2006); *see* Pannu v. Iolab Corp., 155 F.3d 1344, 1350 (Fed. Cir. 1998); MCV, Inc. v. King-Seeley Thermos Co., 870 F.2d 1568, 1570 (Fed. Cir. 1989).

[135] Univ. of Pittsburgh v. Hedrick, 573 F.3d 1290, 1298 (Fed. Cir. 2009).

[136] Eli Lilly & Co. v. Aradigm Corp., 376 F.3d 1352, 1361-62 (Fed. Cir. 2004).

[137] Trovan, Ltd. v. Sokymat S.A., Irori, 299 F.3d 1292, 1301-02 (Fed. Cir. 2002).

[138] *Id.*

hearing.[139] With the meaning of the claims established, the court then compares the accused product or process to the claims on a claim-by-claim basis; if the accused product or process literally or equivalently satisfies all the limitations of a claim, then infringement has occurred.[140]

Under *Trovan*, the procedure to be followed in inventorship analysis also begins with an interpretation of the claims "to determine the subject matter encompassed thereby." The next step is "to compare the alleged contributions of each asserted coinventor with the subject matter of the properly construed claim to then determine whether the correct inventors were named."[141] As one patent lawyer has observed, inventorship is now determined "on a claim-by-claim basis"[142] as well, despite the fact that an inventor on any one claim is considered an inventor of the entire invention (and, therefore, all of the claims).[143]

*Trovan* analysis, which has become the accepted procedure for evaluating disputes about inventorship, creates an aberration in the Federal Circuit's otherwise mostly sound jurisprudence on joint inventorship. In undertaking inventorship analysis, courts now tend to fixate on whether an alleged coinventor can point to specific claims language directly attributable to that alleged coinventor's contributions.[144] The result of fixating on claims is frequently an overly simplistic understanding of the inventive process. In *Eli Lilly & Co. v. Aradigm Corp.*, the Federal Circuit justified its practice of ruling out some collaborators as joint inventors based on the "quality" of inventive contribution:

> The line between actual contributions to conception and the remaining, more prosaic contributions to the inventive process that do not render the contributor a coinventor is sometimes a difficult one to draw. Contributions to realizing an invention may not amount to a contribution to conception . . . if they are too far removed from

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[139] Markman v. Westview Instruments, Inc., 517 U.S. 370, 372 (1996).

[140] *Trovan*, 299 F.3d at 1302.

[141] *Id.*

[142] George M. Sirilla, *How the Federal Circuit Clarified the "Muddy Concept" of Joint Inventorship*, 91 J. PAT. & TRADEMARK OFF. SOC'Y 509, 509 (2009).

[143] Ethicon, Inc. v. U.S. Surgical Corp., 135 F.3d 1456, 1460 (Fed. Cir. 1998).

[144] *See, e.g.*, Bd. of Educ. *ex rel.* Bd. of Trustees of Fla. State Univ. v. Am. Bioscience, Inc., 333 F.3d 1330, 1339 (Fed. Cir. 2003); *Ethicon*, 135 F.3d at 1463 ("[T]his court must determine what Choi's contribution was and then *construe the claim language* to determine if Choi's contribution *found its way into the defined invention*.") (emphasis added).

> the real-world realization of an invention, or if they are focused solely on such realization.[145]

The first point, relating to highly abstract or indefinite contributions, is intended to weed out collaborators who merely point out the goal without contributing concrete ideas for achieving the goal. A collaborator who does nothing more than to propose that the research team develop a vaccine for HIV or a more efficient solar receptor is not an inventor even if the team succeeds in inventing the vaccine or receptor. Yet, it is quite possible to interpret the court's language to deprive legitimate inventors of recognition for their contributions. Sometimes the most difficult and important part of the inventive process is understanding the problem to be solved. The contribution of a collaborator who merely identifies the problem may indeed be far removed from resolving it, but his work may be the foundation or even keystone of the invention.

For example, suppose a research team working for a chemical developer is trying to synthesize an effective insecticide for termites. The goal is to discover a compound to whose toxicity termites find it difficult to adapt by rapid evolution. After years of fruitless and expensive labor on this project, one team member, Carlos, observes that exposure to certain nontoxic chemicals causes the termites to avoid tree wood and preferentially consume other forms of organic matter. After running some experiments, Carlos determines that it is possible that some such chemicals are likely to resist evolutionary adaptation, although it is not clear which chemical compounds would do the trick. After communicating his findings to the team, Carlos is transferred to a different research team. However, based on Carlos's observations, the original team reorients its entire research program and, after a few more months, invents a nontoxic compound that effectively makes lumber termite-proof. Carlos' contribution was undoubtedly "far removed from the real-world realization" of the resulting compound; he does not even know what the compound looks like or how it was produced. Yet, to say that Carlos was not a joint inventor of the compound disserves the goals of patent law. In the scenario, Carlos' contribution was not a mere recitation of the prior art and was integral to and necessary for the invention of the compound. If he is not considered an inventor, he has no incentive to reveal his key insight to the other members of the research team, and the policy goal of Section 116 is subverted. Moreover, he is

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[145] Eli Lilly & Co. v. Aradigm Corp., 376 F.3d 1352, 1359 (Fed. Cir. 2004) (citations omitted).

unfairly denied a reward for a breakthrough discovery that enabled the patented invention.

The *Eli Lilly* court's last point, regarding contributions solely to the "realization" of the invention, is supposed to weed out collaborators who merely performed technical steps in the reduction to practice of an invention already fully conceived.[146] The superficial appeal of this limitation is deceptive as well. The court could merely have been reciting the tautology that, if the invention was already complete, then no further contribution could be significant. If the condition is *not* tautological (or redundant of the other requirements of joint inventorship), then the collaborator in question must have made both a technically significant and nonobvious contribution to making or using a product invention (or performing a process invention). If the resulting idea could not be made or used (or performed) without a significant and nonobvious contribution from a third party, it has not been fully conceived yet. If the collaborator's contribution converts an incipient concept into a mature, invented product or process, then he has satisfied the conditions of joint inventorship. Because knowledge of making and using an invention is part of the invention itself, a significant and nonobvious contribution "solely" to the "realization" (or reduction to practice) of an invention may indeed qualify the contributor as a joint inventor.[147] The necessity of the contribution for patentability strongly suggests that the invention had not yet been fully conceived. The court's statement on this point relates once again back to its fixation on the claims; claims do not necessarily teach how to make and use the invention, so if the claims "define" the invention, then a collaborator who painstakingly discovers how to make or use the invention properly is no inventor if the means of making or using the invention is not recited explicitly in a claim.

While the ambiguities in the Federal Circuit's jurisprudence on joint inventorship may seem technical, their effects are magnified by the all-or-none consequences of inventorship determinations. Section 116 specifies that collaborators are not precluded from designation as inventors by the fact that they did not contribute to every claim in the patent. In *Ethicon Inc. v. U.S. Surgical Corp.*, the Federal Circuit interpreted this provision to give every inventor who contributed to any claim in the patent equal ownership in all claims, including

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[146] *See Ethicon*, 135 F.3d at 1460 ("[O]ne does not qualify as a joint inventor by merely assisting the actual inventor after conception of the claimed invention.").

[147] The Federal Circuit very recently affirmed this point with respect to "making" the invention in *Falana v. Kent State University*, 669 F.3d 1349, 1358 (Fed. Cir. 2012)

claims to which that inventor never contributed.[148] Despite frequent criticism of the court's opinion,[149] the result was all but dictated by the language of Section 116 and the concept of unity of invention that underlies patent law.[150] But this policy has the unfortunate consequence of giving the most important contributor to an invention no greater rights than the least important.[151] The probable result is to dampen the incentive to engage in team research, because adding new members to a research team—especially those not obligated to assign their rights to the same employer—could result in a loss of meaningful patent rights.[152] The current jurisprudence therefore gives patent applicants a strong incentive, and no realistic disincentive, to fraudulently omit joint inventors from the patent application in order to avoid sharing the patent bounty.

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[148] *Ethicon*, 135 F.3d 1456.

[149] *See, e.g.*, *id.* at 1469 (Newman, J., dissenting); Gregory N. Mandel, *Left-Brain versus Right-Brain: Competing Conceptions of Creativity in Intellectual Property Law*, 44 U.C. DAVIS L. REV. 283, 294-95 (2010).

[150] 37 C.F.R. §§ 1.475(a), 1.499 (2011). U.S. law on this subject reflects the requirements of important international patent treaties. *See* PCT, *supra* note 80, arts. 2(i), 3(4)(iii), 17(3); Patent Cooperation Treaty Regs. Rule 13.1 ("The international application shall relate to one invention only or to a group of inventions so linked as to form a single general inventive concept ("requirement of unity of invention")); Paris Convention for the Protection of Industrial Property, *supra* note 81, art. 4(G).

[151] Gregory Mandel has proposed giving proportional rights to joint inventors who made contributions of varying levels to the invention. Mandel, *supra* note 149, at 353. In principle, such a rule could mitigate the problem to a degree, but suggesting the adoption of equitable apportionment methods is much easier in the abstract than operationalizing the concept. Judgments about the relative creativity of different collaborators' inventive contributions would be a highly subjective exercise even with perfect information. In practice, it would be impossible due to the frequent inability to differentiate the source of inventive contributions in collaborative research and the temptation of any given collaborator to "remember" that another's contribution was actually his own. After all, the main purpose of the modern Section 116 of the Patent Act is to eschew nice parsing of inventive contributions among coinventors.

Moreover, not all inventive contributions are creative; some may take the form of perceptive observations of a helpful phenomenon by a prepared mind, or simply by systematic experimentation. Such contributions may qualify as inventive regardless of the absence of creativity. *See* 35 U.S.C. § 103(a). How is a court to weigh, on minimal objective evidence, the incomparable values of one collaborator's creative insight against another's tireless experimentation? Apportionment is, in short, sound in theory but not a practical solution to the problem of skewed inventorship rewards.

[152] *See* Mandel, *supra* note 149, at 347.

### *C. The Strong Presumption of Validity in Inventorship Analysis*

The grant of a patent by the PTO creates a presumption that the patent is correct and valid. The 1952 Patent Act provides expressly that anyone challenging the validity of a patent bears the burden of persuasion that the patent is invalid.[153] This burden originates from early patent law cases in which the U.S. Supreme Court established a general rule of deference to informed decisions of the Patent Office, most notably in *Morgan v. Daniels*:

> Upon principle and authority, . . . it must be laid down as a rule that where the question decided in the Patent Office is one between contesting parties as to priority of invention, the decision there made must be accepted as controlling upon that question of fact in any subsequent suit between the same parties, unless the contrary is established by testimony which in character and amount carries thorough conviction.[154]

The patent applicant actually benefits from a presumption in his favor beginning at the moment the application is filed. The Federal Circuit noted that the PTO bears the burden of challenging the patent applicant's "presumptively correct" allegations regarding the utility of the claimed invention.[155] A private party challenging an issued patent before a court bears an even heavier burden. *Morgan v. Daniels* has long been interpreted by the Federal Circuit and its predecessor, the Court of Customs and Patent Appeals, to mean that anyone challenging the validity of a patent must satisfy an elevated burden of proof, by supplying clear and convincing evidence of invalidity.[156] The "clear and convincing" standard of proof is nowhere to be found in the Patent Act. Its origin is instead a long line of judicial decisions holding that a government agency such as the PTO is "presumed to do its job" correctly.[157] As with other aspects of patent

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[153] 35 U.S.C. § 282(1) (2006).
[154] Morgan v. Daniels, 153 U.S. 120, 121, 125 (1894).
[155] *In re* Brana, 51 F.3d 1560, 1566 (Fed. Cir. 1995).
[156] *See* Nartron Corp. v. Schukra U.S.A., Inc., 558 F.3d 1352, 1356 (Fed. Cir. 2009).
[157] Am. Hoist & Derrick Co. v. Sowa & Sons, Inc., 725 F.2d 1350, 1359 (Fed. Cir. 1984); *see also* Radio Corp. of Am. v. Radio Eng'g Labs., Inc., 293 U.S. 1, 2 (1934).

validity, a private party challenging a patent on grounds of misjoinder or nonjoinder bears the clear and convincing burden of persuasion.[158]

In enacting the 1952 Patent Act, Congress chose not to specify the standard of proof for parties alleging patent invalidity for reasons unknown. In the recent case *Microsoft v. i4i*, the Supreme Court inferred from Congress's silence that the legislature intended to incorporate (part of) the judicially invented standard of proof into the statute.[159] Indeed, the Court asserted that it "must" presume—apparently as a canon of statutory construction—that Congress intended to continue the *status quo* unless the statute otherwise specifies.[160] It is doubtful that, whenever Congress fails to comment on a matter within the scope of a statute, Congress thereby automatically endorses all case law not expressly disclaimed by the statute.[161] However, the fact that Congress has overlooked numerous opportunities to change the highly visible standard of proof suggests that the clear and convincing standard generally aligns with congressional intent in this instance.

Doug Lichtman and Mark Lemley have argued against the strong presumption of validity, except with respect to a narrow category of patent challenges, on policy grounds.[162] Although the courts have never articulated a fully developed policy basis for the strong presumption, Lichtman and Lemley infer the two most likely justifications as being deference to the PTO's expertise and a desire to strengthen patent rights in order to encourage commercialization.[163] But Lichtman and Lemley point out that the PTO does not, probably with current funding cannot, and in any event lacks sufficient motivation to, invest the resources necessary to render an authoritative determination on all questions of patentability.[164] The absence of third-party information in most cases further limits

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[158] Eli Lilly & Co. v. Aradigm Corp., 376 F.3d 1352, 1358 (Fed. Cir. 2004); Fina Oil & Chem. Co. v. Ewen, 123 F.3d 1466, 1472 (Fed. Cir. 1997).

[159] Microsoft Corp. v. i4i Ltd. P'ship, 131 S.Ct. 2238, 98 U.S.P.Q.2d 1857, 1862 (2011).

[160] *Id.*, 98 U.S.P.Q.2d at 1863.

[161] Only Justice Thomas declined to read Section 282 as implicitly incorporating the judicially developed standard of proof. *Id.* at 1868 (Thomas, J., concurring).

[162] Doug Lichtman & Mark A. Lemley, *Rethinking Patent Law's Presumption of Validity*, 60 STAN. L. REV. 45 (2007).

[163] *Id.* at 52-53.

[164] *Id.* at 53-55. Lemley and Sampat's empirical research indicates that the PTO effectively weeds out a small but significant percentage of applications. *See generally* Mark A. Lemley & Bhaven Sampat, *Is the Patent Office a Rubber Stamp?*, 58 EMORY L.J. 181 (2008) (evaluating the PTO's patent rejection rate and finding it at 15%-20%).

the ability of PTO examiners to assess thoroughly the validity of the patent. As for the disincentive to invest in a patent of uncertain validity, Lichtman and Lemley observe that such uncertainty exists in any case and is only one (probably minor) factor affecting commercialization.[165] To the extent that the patent's validity has been insufficiently verified by the PTO, strengthening the presumption of validity distorts patent markets arbitrarily.

Regardless of whether this argument persuades, the justification for the strong presumption of validity fails utterly with respect to matters never considered by the PTO. The PTO relies heavily or entirely on the thoroughness, honesty, and candor of the patent applicant with regard to some patent matters. Even for those confident in the PTO's expertise and rigor, a general presumption that the PTO does its job correctly does not justify a presumption of omniscience. Why should the mere submission of the patent application by self-interested applicants create a *prima facie* presumption of accuracy and truthfulness?[166] On this logic, parties have sometimes challenged the strong presumption of validity with respect to questions not examined by or raised before the PTO. In *Eli Lilly & Co. v. Aradigm Corp.*, the plaintiff made the exceedingly narrow argument that a preponderance of evidence standard should be used "'when there are two co-pending patent applications claiming the same subject matter' in front of the [PTO], one of which issues as a patent allegedly omitting the inventor, and the other of which was filed by the allegedly omitted inventor."[167] The plaintiff, in short, was not challenging the heightened burden of proof in general or even with respect to inventorship questions not considered by the PTO. Its argument was limited to the case in which an interference should have been declared but was not. The Federal Circuit rejected even that limited argument, pointing to the alleged coinventor's "strong temptation" to misrepresent the extent of its involvement in the collaboration and the absence of any risk to its rights in its own patent application, which it could lose in an interference.[168]

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[165] Lichtman & Lemley, *supra* note 162, at 52-53.

[166] *See* Brown v. Edeler, 110 F.2d 858, 861 (C.C.P.A. 1940) (finding that a duly executed joint application is prima facie evidence of joint inventorship); Van Otteren v. Hafner, 278 F.2d 738, 741 (C.C.P.A. 1960) (finding that a duly executed joint application is prima facie evidence of joint inventorship).

[167] Eli Lilly & Co. v. Aradigm Corp., 376 F.3d 1352, 1364 (Fed. Cir. 2004).

[168] *Id.* at 1366-67.

Neither of the *Eli Lilly* court's contentions justifies the clear and convincing evidence standard. The patent applicant seeking to exclude joint inventors has as strong a temptation to misrepresent its role in the inventive process as the alleged coinventors. The same advantages are at stake for each of them—the ability to commercialize (or suppress) the claimed invention. As for the absence of risk, this argument is simply irrelevant. If the issued patent survives challenge by the alleged coinventor, then the patentee may enjoy its patent rights without sharing them with a coinventor. The alleged coinventor will have no right to obtain a junior patent on the same subject matter, so it risks its rights either way. Moreover, the costs of a full-scale patent litigation dwarf the costs of a review or reexamination, and the alleged coinventor faces as much litigation expense as the patentee.

Notwithstanding the *Eli Lilly* decision, a panel of the Federal Circuit faced another, more aggressive challenge to the clear and convincing evidence standard in inventorship determinations in *Vanderbilt University v. ICOS Corp*.[169] Pointing to the PTO's inability to consider the status of alleged coinventors not listed in the patent application, Vanderbilt proposed applying the normal burden of proof.[170] The court again rejected the argument, but this time noted that the plaintiff was "of course free to seek *en banc* reconsideration of our settled law on this issue."[171]

Although the Federal Circuit has always rejected these challenges to the standard of proof since its creation in 1982, courts frequently expressed doubt with regard to matters not before the PTO both before and after 1952. *Morgan* itself required deference only to questions "decided in the Patent Office," and not to questions never considered by the agency.[172] Since then, numerous courts have observed that the rationale for the strong presumption of validity was weakened in such circumstances,[173] and in several cases have actually given reduced deference to the PTO.[174] In *KSR International Co. v. Teleflex, Inc.*, the Supreme Court itself joined the chorus, holding that when a matter had not been raised before the PTO,

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[169] Vanderbilt Univ. v. ICOS Corp., 601 F.3d 1297 (Fed. Cir. 2010).

[170] *Id.* at 1305.

[171] *Id.* n.3.

[172] Morgan v. Daniels, 153 U.S. 120, 125 (1894).

[173] *See Microsoft*, 98 U.S.P.Q.2d at 1866 (collecting cases).

[174] *See, e.g.*, Mfg. Research Corp. v. Graybar Elec. Co., 679 F.2d 1355, 1360-61 (11th Cir. 1982); NDM Corp. v. Hayes Prods., Inc., 641 F.2d 1274, 1277 (9th Cir. 1981); Lee Blacksmith, Inc. v. Lindsay Bros., Inc., 605 F.2d 341, 342-43 (7th Cir. 1979).

"the rationale underlying the presumption—that the PTO, in its expertise, has approved the claim—seems much diminished."[175]

Nonetheless, the Supreme Court has recently enshrined a uniform clear and convincing evidence standard for all aspects of the issued patent. The Court in *Microsoft Corp. v. i4i Ltd.* declined to interpret prior cases to cast doubt on the clear and convincing evidence standard, despite seeming to recognize in the same pre-1952 cases many doubts about the logic of the clear and convincing evidence standard applied to matters unexamined by the PTO.[176] By the majority opinion's logic, Congress should also be "presumed" to have codified these cases. Instead, the *i4i* Court adopted an expedient, holding that when a matter was not considered by the PTO, the PTO's judgment "may lose significant force" and "the challenger's burden to persuade the jury of its invalidity defense by clear and convincing evidence may be easier to sustain."[177]

Just how the challenged part of the patent "los[ing] significant force" differs meaningfully from lowering the burden of proof is hard to comprehend. Operationally, the Court has intimated that the trial judge can, or perhaps must, notify the jury that the facts at issue were never considered by the PTO while at the same time insisting that the jury apply the clear and convincing standard of proof.[178] But the jury never bases its judgment of patent validity on an assumption of the PTO's infallibility. The facts are presented to the jury, and the court explains its interpretation of the law, including the burden and standard of proof. The jury may be expected always to decide the question of patent validity based on the facts presented to it, regardless of whether the PTO considered the same question earlier based on different (or no) facts. The jury is not called upon to judge the PTO's thoroughness or accuracy. If the standard of proof does not vary, neither will the jury's judgment. How could it?

By holding that the 1952 Patent Act codified the clear and convincing evidence standard without equally codifying the case law doubting the uniform applicability of that standard, the Court has seriously undermined a key element of the patent system's logic. The Court has at best created arbitrary doctrine favoring patent owners and at worst created an incentive for dishonest prosecution practices.

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[175] KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 426 (2007).
[176] *Microsoft*, 98 U.S.P.Q.2d at 1865-66.
[177] *Id.* at 1866.
[178] *Id.*

The applicant controls the patent application process and decides which information to reveal to the PTO and which to withhold. The PTO, badly overburdened with applications[179] and staffed with examiners who are rarely expert in the specific technology at issue, does not always thoroughly examine such questions as novelty and nonobviousness, and never questions a superficially credible allegation of utility or inventorship. The clear and convincing evidence standard gives applicants a perverse incentive to obtain a patent fraudulently and enjoy special legal protection for their misdeeds.

Recently, the Federal Circuit managed to compound the errors of the *i4i* jurisprudence under the bizarre circumstances of *Sciele Pharma v. Lupin Ltd*.[180] The patent applicant in that case had received nonobviousness rejections on some of its claims by the PTO examiner. In response, the applicant canceled the claims, effectively creating a public record that the applicant and examiner agreed that the claims were invalid. Nevertheless, by a PTO error, the patent as ultimately issued reinstated the canceled claims.[181] The patentee, instead of seeking a certificate of correction, reexamination, or reissue to correct the error, ignored it. When the patentee attempted to assert these claims in an infringement litigation, the accused infringer attacked the claims as invalid. The claims, the defendant argued, should not benefit from the strong presumption of validity, because they were clearly invalid by public acknowledgement of both the patent applicant and PTO. Nonetheless, the Federal Circuit insisted that admittedly invalid claims should be presumed valid with the elevated standard of proof under *i4i*.[182] One wonders whether the next doctrinal step will be for courts to uphold as valid claims that the patentee openly admits are invalid during the litigation itself.

The consequences for joint inventors alleging unlawful nonjoinder to the patent will be especially unfortunate. The flaws in using an enhanced burden of proof for unexamined patent matters are multiplied in the inventorship context by two key differences between the PTO's inventorship "determination" and any other possible challenge to the patent. First, a charge of nonjoinder or misjoinder does not usually invalidate the patent. The normal remedy is merely correction by

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[179] *See* Mark A. Lemley, *Can the Patent Office Be Fixed?*, *in* RULES FOR GROWTH 367 (Robert Litan ed., 2011); Allison & Lemley, *supra* note 19 at 2118–19.

[180] 684 F.3d 1253 (Fed. Cir. 2012).

[181] *Id.* at 1256-57.

[182] *Id.* at 1260-61.

judicial amendment of the patent.[183] The consequences of being forced to share patent rights with a coinventor are rarely as dire as the complete invalidation of the patent or its operative claims, and so justify less extraordinary protections for the patentee. Second, as noted, the PTO virtually never questions the applicant's assertions of inventorship when examining the patent. It relies on the oath of the inventors, which must identify each inventor of the invention for which a patent is sought.[184] Patent applicants seeking to exclude a coinventor for self-serving purposes may have little compunction about misrepresenting inventorship. Because the PTO is well known not to examine inventorship, the chances of discovery are slim unless the patent is challenged in court under the enhanced burden of proof. Even if the patent is challenged, as noted, the result will not be any kind of sanction but mere correction of inventorship. There is no minimally convincing justification for applying the clear and convincing evidence standard to questions of inventorship.

What is perhaps most ironic about the strong presumption of validity of the PTO's fictitious inventorship "determination" is that the Federal Circuit has consistently treated inventorship as a question of law rather than a question of fact. Specifically, it has called the "overall inventorship determination" a question of law, which is "premised on underlying questions of fact."[185] The court has also observed that the "determination of whether a person is a joint inventor is fact specific, and no bright-line standard will suffice in every case."[186]

These pronouncements suggest some confusion as to the distinction between questions of law and fact. Questions of law necessarily reference the facts that must be present to satisfy the test of legality. Whether these facts are present in any given case is, by definition, not a question of law. The question of fact in the case of joint inventorship is the alleged coinventor's role in conceiving the invention. The manner of and degree to which a contribution enables or improves the conception of the invention, or the process of conception, are also questions of

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[183] *See* 35 U.S.C. §§ 116, 256.

[184] 35 U.S.C. § 115; 37 C.F.R. § 1.63(a)(2).

[185] *See* Eli Lilly & Co. v. Aradigm Corp., 376 F.3d 1352, 1362 (Fed. Cir. 2004).

[186] Fina Oil & Chem. Co. v. Ewen, 123 F.3d 1466, 1473 (Fed. Cir. 1997). Specifically, as one court observed, "[t]he findings relating to joint inventorship issues such as conception and inventive contributions are dependent upon an understanding of the scientific problem or problems the parties were trying to resolve." Rhone-Poulenc Agro, S.A. v. Monsanto Co., 445 F. Supp. 2d 531, 535 (M.D.N.C. 2006).

fact. Whether the facts satisfy the legal standard of significance requires an assessment of how those facts match up to the legal standard—traditionally, a matter within the province of the factfinder, not the court.[187]

The Federal Circuit is mistaken, then, in concluding that "whether a person is a joint inventor" is a question of law. The standard of law is indeed a bright line: either the alleged coinventor made a significant contribution to conception of the invention, or she did not. There is nothing in between. The pertinent question of law is typically what kind of contribution to conception is sufficiently "significant" to qualify the contributor as a joint inventor. What the court means in saying that there is no bright line, rather, is that it feels unable to articulate with great precision what is the standard of "significance" as a rule for all cases. The question of law is what the standard of significance should be, not whether any specific alleged coinventor's contribution *is* significant.

In any case, given that the Federal Circuit has adopted the position that inventorship is a question of law, it follows that the appellate court should give no deference to the PTO's decision on inventorship and should thus review challenges to inventorship under the normal preponderance of evidence standard. Appellate courts defer to lower tribunals on questions of fact only, while reviewing determinations of law *de novo*.[188]

## II
## RELINKING INVENTORSHIP ANALYSIS TO TECHNOLOGY POLICY

The previous part revealed how the dysfunction in joint inventorship law can be traced to two key doctrines. The first is the treatment of claims as if they defined the invention rather than merely limited the scope of its patent protection.

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[187] Judge Rader offered a similar objection to the Federal Circuit's treatment of experimental use as a question of law. *See* Lough v. Brunswick Corp., 103 F.3d 1517, 1532-33 (Fed. Cir. 1997) (Rader, J., dissenting from the denial of rehearing *en banc*) ("With factual considerations dictating the outcome of the underlying analysis, logic relegates the standard of review to the factual realm as well. . . . Frankly the proposition that experimental use—a judge-made doctrine without any express basis in the Patent Act—is a question of law is absurd on its face. It is hard to imagine how case law decisions made by judges to resolve unique factual cases on a fact-driven issue could create questions of law."). His reasoning applies *a fortiori* to the issue of inventorship. On the disputed standard of review of mixed questions of law and fact, see generally Evan Tsen Lee, *Principled Decision Making and the Proper Role of Federal Appellate Curts: The Mixed Questions Conflict*, 64 S. CAL. L. REV. 235 (1991).

[188] *See* Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1376 (Fed. Cir. 1986).

The second is the strong presumption of validity for all aspects of the patent, including inventorship, in the absence of any cogent policy justification for such a presumption. Combined, these two positions threaten to warp the logic of inventorship and to undermine the incentives for collaborative research. In Part III.A, the alignment of modern inventorship doctrine with the legislative intent underlying the adoption of the 1984 amendments to Section 116 of the Patent Act will be evaluated. Part III.B follows with an analysis of the policy consequences of the current inventorship doctrine and a proposal for how to correct it to conform to legislative intent and the public policy favoring team research.

### *A. Legislative History of the 1984 Patent Law Amendments Act*

Congress faces relatively few constitutional limitations on its ability to grant and enforce patent rights. The journals of the 1787 constitutional convention record no debate on the intellectual property clause, which appeared in the earliest drafts of the Constitution and was unanimously approved and passed. The clause empowers Congress "To promote the Progress of . . . useful Arts, by securing for limited Times to . . . Inventors the exclusive Right to their . . . Discoveries."[189] It has long been accepted that the clause means approximately what it says; it authorizes Congress to give to inventors an "exclusive" right to practice their inventions[190] for the purpose of encouraging the development of new applied technology (the "useful Arts"). The Constitution thus seems to mandate that patent legislation be interpreted in the manner most likely to advance technology. In pursuing this goal, patents must be granted to the true inventors of the invention patented; the Constitution nowhere authorizes the grant of exclusive rights to persons other than inventors.[191] Both the first Congress and the Supreme Court accordingly interpreted the clause to require the patent reward to be directed to the true inventor of the invention for which a patent is sought.[192]

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[189] U.S. CONST. art. I, § 8, cl. 8.

[190] On the seemingly odd choice of the word "Discoveries," see Demaine & Fellmeth, *supra* note 1, at 367-74.

[191] This is not to say that the Constitution forbids Congress to allow inventors to assign their rights to others, of course.

[192] *See* An Act to Promote the Progress of Useful Arts (Patent Act of 1790), ch. 7, sec. 1, 1 Stat. 109 (Apr. 10, 1790); Grant v. Raymond, 31 U.S. (6 Pet.) 218, 242 (1832) ("[The patent] is the reward stipulated for the advantages derived by the public for the exertions of the individual [inventor], and is intended as a stimulus to those exertions.").

The legislative history of the 1984 PLAA tells much about its policy purposes, and these align well with the Constitution's mandate. The PLAA began as a pair of bills introduced in the Senate and House of Representatives in 1983 "to make certain clarifications with respect to joint inventors." The bills in each case merely provided that each inventor "need not have made a contribution to each claim contained in the application."[193] These early drafts were intended to reverse the judicial "all claims rule," requiring every collaborator to have contributed to every claim in a patent in order to qualify as an inventor on that patent.[194] The all claims rule forced research teams to struggle to parse out each collaborator's contribution to each claim and to file multiple patents on closely related inventions, with a resulting risk that some patents would become prior art and preempt others by the same collaborators.

The 1983 bills were popular with the patent bar and inventing industries, but these also viewed the bills as an opportunity to codify certain other key pre-Federal Circuit judicial decisions, such as *Monsanto v. Kamp*.[195] The patent bar lobbied Congress through the American Intellectual Property Law Association (AIPLA) and other bar and industry organizations. On March 15, 1984, AIPLA submitted a proposed amendment to the bills specifically intended to open the door to joint inventorship in the kinds of collaboration not involving direct contact between joint inventors or an equal contribution by each. The amendment's goals were described in testimony by AIPLA's president:

> Researchers in an organization sometimes work on one aspect of an invention, while others may work on a different aspect. Personnel are continually added to the research team, while others may leave the team. Concepts and development are often generated through

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[193] H.R. 4527, 98th Cong. (1983); S.B. 1535, 98th Cong., 1983 Cong. Rec. S9006.

[194] *See, e.g.*, *In re* Sarett, 327 F.2d 1005, 1010, n.7 (Ct. Cust. & Pat. App. 1964).

[195] Congress established the U.S. Court of Appeals for the Federal Circuit in 1982 in order to centralize appeals for patent cases. Before 1982, the U.S. Court of Customs and Patent Appeals handled all appeals from administrative actions by the PTO, but appeals arising from infringement litigation were decided by the various circuit courts. The Federal Circuit was designed to remedy the lack of uniformity in patent doctrine arising from this fracturing of authority. See generally THE U.S. JUDICIAL CONF. COMM. ON THE BICENTENNIAL OF THE CONSTITUTION OF THE U.S., THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT: A HISTORY 1982-1990 (1991) (describing advent of the Federal Circuit); Daniel J. Meador, *Origin of the Federal Circuit: A Personal Account*, 41 AM. U.L. REV. 581 (1992) (same).

> brainstorming and cannot accurately be attributed to a particular inventor or inventors. The criteria for joint inventorship, as the amendments to Section 116 would state such criteria, have been judicially recognized.[196]

The main judicial recognition to which the AIPLA president referred was *Monsanto v. Kamp*. His testimony made clear that paragraphs (1) and (2) of the new Section 116 were adopting the criteria cited by the *Kamp* district court.[197] The AIPLA report to the House Subcommittee on Courts, Civil Liberties, and the Administration of Justice repeated these concerns:

> A research project in today's environment may include many inventions and some inventions may have contributions which are made by some individuals who were not involved in other aspects of the invention. It is appropriate to recognize the contribution of each individual even though the individual may not have been involved in, or may not have contributed to, all aspects of the invention.[198]

High-ranking PTO officials supported the AIPLA amendments with testimony that paralleled or duplicated the AIPLA rationales for amending Section 116.[199] In his written statement to Congress, the Commissioner of Patents echoed AIPLA's point about the difficulty of pinpointing the source of inventive contributions during collaborative research:

> 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

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[196] Statement of Bernarr R. Pravel, President, Am. Intel. Prop. L. Ass'n, before the House Subcommittee on Courts, Civil Liberties, and the Administration of Justice (June 13, 1984), *in* Innovation and Patent Law Reform (Mar. 28, Apr. 26, & June 6, 27, 1984), 98th Cong., 2d Sess., Pt. 3, Serial No. 105, at 2690, 2719 [hereinafter "Innovation and Patent Law Reform Hearings"].

[197] *Id.* at 2735-36.

[198] *Id.* at 2737.

[199] Testimony Of Gerald J. Mossinghoff, Assist. Sec'y & Comm'r of Pats. & Trademarks, Accompanied by Donald Quigg, Dep'y Asst. Sec'y & Dep'y Comm'r of Pats. & Trademarks, & Rene D. Tegtmeyer, Asst. Comm'r for Pats. (Mar. 28, 1984), *in* Innovation and Patent Law Reform Hearings, *supra* note 196, at 2, 7.

> generated through brainstorming cannot always be accurately attributed. . . . H.R. 4527 would eliminate the need for making these sometimes chancy, complex and time-consuming determinations by specifying that joint inventors need not have contributed jointly to each claim in an application. As we understand the provision, inventors would also be regarded as joint inventors whether or not they physically worked together at the same place or at the same time in developing the invention. Further, joint inventorship would not require that each inventor make the same type or amount of contribution to the invention or that each make a contribution to the subject matter of each claim of the patent.[200]

The Commissioner was mistaken in asserting that the amendment would "eliminate" the need to make a determination of inventive contribution, because, after the amendment, the applicants would still have to determine whether each collaborator listed as an inventor had made the threshold contribution to conception. The amendment would, however, create a more uniform standard and lower threshold for qualifying as a joint inventor, which would reduce the risk of nonjoinder and misjoinder.

Identical statements were made by the Commissioner of Patents before the Senate Judiciary Committee.[201] Industry representatives also testified overwhelmingly in favor of the amendments.[202] Representatives of industries in which collaborative research is extremely common if not critical to commercial success, such as industrial chemicals and pharmaceuticals, supported the bill on these grounds. The American Chemical Society's letter of support asserted:

> The proposed modification of Section 116 of 35 U.S.C. is appropriate and just, for it recognizes that much research that results in an invention is conducted on a team basis. Team members may each contribute to a significant stage of the research, but seldom does each

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[200] Statement of Gerald J. Mossinghoff, *in id.* at 28-29.

[201] *See* Patent Law Improvements Act, Hearing before the Subcomm. on Patents, Copyrights and Trademarks of the Comm. on the Judiciary, U.S. Senate, 98th Cong., 2d Sess., on S.1535 and S. 1841 (Apr. 3, 1984), Serial No. J-98-107, at 18, 32-34 (Mossinghoff), 70 (AIPLA) [hereinafter "Senate Judiciary Comm. PLAA Hearings"].

[202] *E.g.*, 130 CONG. REC. 28,075 (1984) (statement of Rep. Moorhead); *see* W. Fritz Fasse, *The Muddy Metaphysics of Joint Inventorship: Cleaning Up After the 1984 Amendments to 35 U.S.C. § 116*, 5 HARV. J.L. & TECH. 153, 175 (1992).

> team member contribute to each stage. The ACS supports this modification for it removes the inequity of depriving an individual of the status of joint inventor when that person was a significant contributor to an invention.[203]

In response to these suggestions, the sponsor of House Bill 4527 (Rep. Kastenmeier) let that version die in committee and introduced a new bill, H.R. 6286, in November 1984 containing AIPLA's language *verbatim*.[204] In doing so, Kastenmeier also mentioned the new bill's expected benefits to "universities and corporations which rely on team research"[205]—a purpose also reflected in the official analysis of the bill.[206] The Senate bill was similarly amended, with a parallel explanation of the purpose of the bill described as recognizing "the realities of modern team research."[207] The report of the post-conference bill made identical references to these "realities" and made explicit that paragraphs (i) and (ii) adopted "the rationale of decisions such as *Monsanto v. Kamp*."[208] The President's statement on signing the bill into law, too, emphasized its utility for removing technical obstacles to team research.[209]

With strong industry support and minimal opposition to the bills, Congress enacted the amendment to Section 116 in the precise words proposed by AIPLA.[210] The legislative history indicates that the primary purpose of the PLAA was to codify a flexible standard of joint invention in order to encourage team research and, ultimately, efficient technological development. Congress evidently perceived no coherent policy purpose in forcing large research companies and university science and engineering laboratories to conform to arbitrary rules about which researcher may participate on a team without precluding a valid patent or at

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[203] Letter from Warren D. Niederhauser, Pres.-Elect, Am. Chem. Soc'y, to Robert W. Kastenmeier, Chair, House Subcomm. on Cts., Civ. Libs., & the Admin. of Just. (Apr. 20, 1984), in Senate Judiciary Comm. PLAA Hearings, *supra* note 201, at 2617.

[204] H.R. 6286 (1984).

[205] 1984 Cong. Rec. 28073 (Oct. 1, 1984) (statement of Rep. Kastenmeier).

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

[207] S. Rep. No. 998-663, 98th Cong., 2d Sess. (Oct. 5, 1984), at 8.

[208] 1984 U.S.C.C.A.N. 5827, 5834-35.

[209] President's Statement on Signing H.R. 6268 into Law, 20 WEEKLY COMP. PRES. DOC. 1818 (Nov. 9, 1984).

[210] *See* Innovation and Patent Law Reform Hearings, *supra* note 196, at 2720 (introducing the amendment to Section 116 of the Patent Act as adopted by Congress).

least raising the costs of patenting. Ideally, the sole determinant of research collaboration should be the most efficient use of research personnel and resources. Interfering with the research efficiency hardly advances the patent law's purpose of fostering technological development.

With its exclusive concern the promotion of collaborative research, the PLAA amendment to Section 116 left the substantive definition of conception untouched. The amendment does confirm that different collaborators may make different types and amounts of contributions without losing their status as coinventors, and it does not limit such contributions to any specific subclass of inventive input. Beyond that, the PLAA had nothing to say about the standard of inventorship.

Yet, the Federal Circuit soon began interpreting inventorship in a manner that privileges certain kinds of inventive contributions while dismissing other, equally valuable contributions. In *Ethicon v. U.S. Surgical Corp.*,[211] the court's analysis focused on whether the putative inventor's contribution appears in the claims. The court qualified this by stating elsewhere in the case that coinventorship depends not on a contribution to the claim itself or specific language in the claim, but rather on whether the collaborator "contributed to the *invention*" defined and limited by a claim.[212] Nonetheless, the court in *Trovan* reinforced the doctrinal fixation on claims by laying out a formal procedure for determining inventorship that seemed to rigidly ignore every inventive contribution not reflected in specific claim language.[213]

As discussed, *Ethicon* and *Trovan* set forth a procedure for determining inventorship. However, the Federal Circuit has never explicitly held that an inventor's contribution must appear *expressis verbis* in the claims. In both *Ethicon* and *Trovan*, the inventor had allegedly contributed specific, identifiable limitations or elements to a combination invention. In *Trovan*, the alleged contribution was the addition of a wire support feature to an electronic transponder. In *Ethicon*, the

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[211] In *Ethicon v. U.S. Surgical Corp.*, the court wrote that it must construe the claim language to determine whether the putative coinventor's contribution "found its way into the defined invention." *Ethicon Co. v. U.S. Surgical Corp.*, 135 F.3d 1456, 1463 (Fed. Cir. 1998).

[212] *Id.* at 1461-63.

[213] *Trovan, Ltd. V. Sokymat S.A.* Irori, 299 F.3d 1292 (Fed. Cir. 2002). *See, e.g.*, Eli Lilly & Co. v. Aradigm Corp., 376 F.3d 1352, 1361-62 (Fed. Cir. 2004) ("[T]he law requires only that a coinventor make a contribution *to the conception of the subject matter of a claim*.") (emphasis added).

alleged contribution was the addition of a safety feature (a "detaining means") to a surgical trocar. In both cases, the contribution was a specific physical feature integrated into the invention. Such features are almost invariably set forth explicitly in the claims, and the Federal Circuit accordingly focused on whether the alleged coinventor's contribution was encompassed by the claims. The contribution to the claims in such cases served as a satisfactory proxy for an analysis of whether the inventor contributed to the invention itself. In neither case did the Federal Circuit repudiate the importance of contributing to the *invention* when that contribution was not recited explicitly in the claims. Indeed, the court has recognized that a coinventor must contribute to the conception of the "invention" rather than the claims.[214] The picture that emerges from these cases is one of a jurisprudence mired in confusion about the critical distinction between the claims and the invention.

The most problematic aspect of *Trovan* analysis, which has become the normal procedure for determining inventorship, is its elision of the distinction between claims and invention through the inapposite analogy of inventorship to infringement analysis. Infringement analysis is not a good parallel to inventorship analysis for several reasons. Most importantly, the two analyses serve entirely different policy purposes. Infringement analysis focuses tightly on the claims because the Patent Act's disclosure requirements limit the scope of the patent. In the infringement context, focusing on the claims makes good sense. The claims are meant to limit the inventor's enforcement powers. By definition, infringement means that the accused product or process has trespassed on one or more of the specific claims. It follows that infringement analysis should revolve around the claims.

However, even in the infringement context, the claims are not the only or even last word on the scope of patent protection. Courts have generally recognized that, as important as claims are to determining whether patent infringement has occurred, they do not exist in a vacuum, but rather should be interpreted in the context of the invention as a whole, as described in the specification and prosecution history.[215] Moreover, using the doctrine of equivalents, courts have

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[214] Bd. of Educ. *ex rel.* Bd. of Trustees of Fla. State Univ. v. Am. Bioscience, Inc., 333 F.3d 1330, 1337 (Fed. Cir. 2003) ("[E]ach joint inventor must *generally* contribute to the conception of the *invention*.") (emphasis added).

[215] *See, e.g.*, United States v. Adams, 383 U.S. 39, 49 (1966); Phillips v. AWH Corp., 415 F.3d 1303, 1315 (Fed. Cir. 2005) (*en banc*); Retractable Techns., Inc. v. Becton, Dickinson &

expanded patent protection to encompass more of the invention than the inventor technically claimed.[216] Why should the patent owner have the right to enforce the patent against a product or process not explicitly claimed in that patent? The answer can only be that the doctrine is designed to protect the invention when the claims do not fully capture that invention. Such a theory is possible only if the invention is something greater than the claims. The theory underlying the doctrine of equivalents is precisely that the invention and the claims are different but overlapping concepts.

The need for claims relates especially to their public notice function. Claims serve the purpose of putting the public on notice of what practices the patent forbids, while the patent document as a whole also teaches the public how to practice the invention. An infringement determination is the precondition to enforcing the patent, and so focusing on the claims protects accused infringers against being subjected to damages and penalties that were unforeseeable based on the claim language. Limiting infringement actions to the claims requires the inventor, as the person with the most control over the phrasing of the patent application, to define as clearly as possible the scope of the invention so that competitors will be given fair notice of the subject matter protected by the patent.[217] Accordingly, infringement (at least, literal infringement) means intrusion on the claims by definition. If the accused infringer's activities did not fall within the scope of the claims as reasonably interpreted, and did not equivalently infringe, the accused infringer need fear no sanctions.

In contrast, an inventorship determination is designed neither to protect the public's expectations about which technologies they are free to use nor to maintain the patent's value against threats by competitors. It is instead intended to encourage innovation and, in the context of Section 116 of the Patent Act, to preserve the incentives for collaboration between persons having complementary skill sets or whose research work otherwise synergizes well. Accordingly, Section 116 of the Patent Act nowhere says or implies that the inventive contribution must appear in the claims portion of the specification. Getting inventorship right

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Co., 653 F.3d 1296, 1303 (Fed. Cir. 2011), *reh'g en banc denied*, 659 F.3d 1369 (Fed. Cir. 2011). *But cf. id.* at 1312-13 (Rader, J., dissenting in part) (cautioning against importing limitations on claims from unclear language in the written description).

[216] *See* Graver Tank & Mfg. Co. v. Linde Air Prod. Co., 339 U.S. 605 (1950).

[217] *See* Gen. Elec. Co. v. Wabash Appliance Corp., 304 U.S. 364, 369 (1938); Hoganas AB v. Dresser Indus., 9 F.3d 948, 951 (Fed. Cir. 1993).

encourages inventive activity by rewarding those persons who make a significant contribution to the invention and serves equity by ensuring that no collaborator free-rides off another collaborator's important contribution. For these purposes, the appearance of a collaborator's contribution in the claims may indicate that the collaborator is a *bona fide* coinventor if the contribution is significant, goes to conception, and does more than recite the state of the art. Nothing in the pre-1984 case law or the PLAA suggests the adoption of a change in the substantive standard of inventorship to exclude any collaborator whose contributions do *not* appear in the claims. The policy rationale for not limiting inventorship analysis to the claims is further explored in the next section.

Unfortunately, the clarity of the jurisprudence on joint inventorship has been further degraded by imprecise language in *American Board of Education v. American Bioscience, Inc.*,[218] where the Federal Circuit suggested that a collaborator could not be a joint inventor of a class of chemical compounds unless it "conceived" one "of the claimed compounds."[219] These *dicta* do not actually reflect the trend of Federal Circuit jurisprudence on the whole. The court stated in *Ethicon* that each joint inventor "needs to perform only a part of the task which produces the invention,"[220] as provided in Section 116 of the Patent Act. In *Fina Oil*, the court was even clearer: "One need not alone conceive of the entire invention, for this would obviate the concept of joint inventorship."[221] Imagine the probability of all joint inventors simultaneously forming identical pictures in their individual minds of the entire operative invention.

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[218] *Bd. of Educ.*, 333 F.3d 1330 (Fed. Cir. 2003).

[219] *Id.* at 1340-41.

[220] Ethicon, Inc. v. United States Surgical Corp., 135 F.3d 1456, 1460 (Fed. Cir. 1998).

[221] Fina Oil & Chem. Co. v. Ewen, 123 F.3d 1466, 1472 (Fed. Cir. 1997); *see also* Rhone-Poulenc Agro, S.A. v. Monsanto Co., 445 F. Supp. 2d 531, 549 (M.D.N.C. 2006) ("[N]either the statute nor the cases relating to joint inventorship requires the simultaneous presence or awareness of all who have contributed significantly toward conception when the last piece of the conception puzzle slips into place."); Regents of the Univ. of Mich. v. Bristol-Myers Squibb Co., 301 F. Supp. 2d 633, 642 (E.D. Mich. 2003) ("[A] joint inventor need not have had the definite and permanent conception of the full invention – otherwise, he would be the sole inventor."); Tavory v. NTP, Inc., 297 F. Appx. 976, 979, 2008 WL 4710761, **4 (Fed. Cir., Oct. 27, 2008) (unpub.) ("[N]o individual coinventor need have a 'definite and permanent idea of the complete and operative invention' so long as all of the coinventors collectively satisfy that requirement.").

### *B. Reconstructing Inventorship*

It will be helpful here to summarize the main points of the argument so far. Claims limit the protectable aspect of the invention; they do not "define" the invention, as courts frequently assert. Inventorship analysis cannot be analogized to infringement analysis, as the Federal Circuit has erroneously suggested in *Ethicon*, *Trovan*, and a long line of subsequent cases. It is unnecessary for a collaborator on a research team to have contributed specific language to a claim in order to qualify as a joint inventor, so long as he or she satisfies the three *Pannu* conditions.

These observations lead to the conclusion that a collaborator who makes a significant contribution to the conception of an invention may qualify as a coinventor without the need for *Trovan* analysis. More specifically, a collaborator who makes a sufficient contribution to the utility or nonobvious aspect of the invention, or to the method of making or using it, may qualify as an inventor even if his contribution does not appear in the claims. Without such contributions, there might have been no invention at all, and therefore no patent with claims to enforce. Claims limit the patentee's enforcement powers; they do not, however, suffice to *qualify* the invention for patent protection. That protection is contingent on the invention's novelty, nonobviousness, utility, and adequate disclosure. Unless the coinventors collectively satisfy all of these requirements, no patent may issue in the first place.

A uniform requirement to conduct *Trovan* inventorship analysis, in confusing the claims with the invention, undermines this dynamic. If the invention were nothing more than the claims, the analogy to infringement analysis would make sense. But the invention is different, sometimes radically different, from the claims. The resulting merging of the claims with the invention disenfranchises any coinventor whose contribution the patent applicant did not expressly describe in the claims as a limitation, no matter how important that contribution might have been. This section will discuss how a correction of the judicial understanding of "invention" can point the way toward a correction of determinations of joint inventorship. With such a correction, the incentives toward collaborative research and disincentives toward strategic nonjoinder of inventors can be restored.

#### *1. Equity and Strategic Nonjoinder*

Dan Burk and Mark Lemley have explained some practical consequences of overemphasizing the claims and ignoring the invention as a whole. As they point out, patent applicants can draft claims narrowly in order to get around objections

by the examiner and to obtain a patent, and then later interpret the claims broadly in light of the specification or through the doctrine of equivalents:

> The shift in focus from the invention to the claim language allows both sides to game the process. It permits—and indeed even encourages—over claiming by patentees, particularly patentees drafting or interpreting claims years after the invention itself. If the focus is on the language of my claims, not the product that I actually built or described, I can interpret the language creatively to claim, in retrospect, to own inventions that I didn't have in mind when I wrote the patent claims.[222]

The result is to undermine the disclosure and public notice function of Section 112 of the Patent Act. The patent bar is well aware of these consequences and capitalizes on them as a matter of course. Although some patent lawyers avoid overclaiming to strengthen the patent against potential challenges, most seek to draft claims broadly by default.[223]

With regard to inventorship determinations, the focus on the claims would allow legally sophisticated researchers to exclude naïve collaborators from inventorship by drafting claims in a manner that underplays or ignores the latter's crucial inventive contributions, without which the patent might have been unobtainable. Consider the following scenario:

{3} Three scientists, Delta, Epsilon, and Zeta, jointly begin a research project for the discovery of a flexible, bulletproof fabric. Through extensive testing, Delta and Epsilon rule out hundreds of fiber candidates and suggest several molecular and material characteristics that a bulletproof fabric would have, with clues to how one could fabricate such fibers. With this guidance in hand, Zeta successfully creates the material.

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[222] Dan L. Burk & Mark A. Lemley, *Fence Post or Sign Posts? Rethinking Patent Claim Construction*, 157 U. PA. L. REV. 1743, 1762 (2009).

[223] *See, e.g.*, Thalia V. Warnement & Troy E. Grabow, *Drafting the Patent Specification*, Am. Intell. Prop. L. Ass'n, Practical Patent Prosecution Training For New Lawyers, Aug. 2008, *at* http://www.aipla.org/learningcenter/library/papers/bootcamps/08patentbootcamp/Documents/Grabow-paper.pdf; Rajiv Sarathy, *Broad Patents Can Be Both Lucrative and Expensive*, Perkins Coie Patent Law Insights, Nov. 21, 2009, *at* http://www.patentlawinsights.com/tags/broad-claims/.

In this case, all three collaborators qualify as joint inventors on the resulting patent. The contributions of each are *ex hypothesi* more than mere recitations of well-known principles and are plainly significant to the invention's novelty, nonobviousness, and utility. The Federal Circuit has accurately observed that "a person is not precluded from being a joint inventor simply because his or her contribution to a collaborative effort is experimental,"[224] so the fact that Delta and Epsilon were not involved in the final steps in inventing and crafting the patented material does not deny them joint inventor status.[225]

Yet, suppose Zeta, who is the only inventor in possession of a complete mental picture of the fabric, were to apply for a patent without crediting Delta and Epsilon as coinventors. Zeta could rely on *Trovan* and its progeny to support his self-identification as the sole inventor of the material. Focusing on the claims, a court would compare the inventive contributions of Delta and Epsilon to the claim language. Nothing in the claims would necessarily point to the contributions of Delta and Epsilon, especially if Zeta drafted the claims strategically. The claims would certainly not mention anything about the fiber candidates that Delta and Epsilon had so painstakingly ruled out; claims describe what the applicant regards as the invention, not what the applicant regards as irrelevant or nonfunctional. Yet, much of the inventive process is typically "negative discoveries" that winnow the paths toward the inventive goal to the smallest number possible.[226]

Nor would the claims necessarily refer to the material's bulletproof characteristics; claims (especially in the chemical, metallurgical, and pharmaceutical arts) commonly describe an invention without reference to its utility or purpose. This information would most likely appear in the written description portion of the patent. The reason for its omission from the claims

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[224] Fina Oil & Chem. Co. v. Ewen, 123 F.3d 1466, 1473 (Fed. Cir. 1997); *see* Burroughs Wellcome Co. v. Barr Labs., Inc., 40 F.3d 1223, 1229 (Fed. Cir. 1994).

[225] A few district courts have misread the Patent Act to allow courts to exclude as joint inventors collaborators who left the research team after the experimental stage. *See, e.g.*, Huang v. California Inst. of Tech., 72 U.S.P.Q.2d 1161, 1177 (C.D. Cal. 2004) ("To judge the significance of an alleged joint inventor's contribution to the complete invention, a court may consider whether the alleged joint inventor was able at the relevant time period to understand and articulate the inventive team's final operative embodiments."). This misses the entire point of the 1984 amendment to Section 116, which was based the desire to grant equal reward to early stage team members, as the *Kamp* decision upon which the amendment was based indicated. *See* Monsanto Co. v. Kamp, 269 F. Supp. 818 (D.D.C. 1967).

[226] *See* Sean B. Seymore, *The Null Patent*, 53 WM. & MARY L. REV. 2041 (2012).

makes sense in the context of patent law, where a patent grants exclusionary rights to the patented invention used for *any* purpose, regardless of whether it was a purpose contemplated by the inventor. Patent applicants accordingly omit reference to the utility and other details of the invention in the claims to avoid narrowing the scope of the claims. The motivation of seeking a patent that covers unforeseen uses of, or methods of making, a patented product is logically unconnected to, and has no effect on, the determination of inventorship of that product. The utility of an invention, and the knowledge of how to make and properly use it, are essential aspects of the invention, even if they do not necessarily limit its protections.

As the only collaborator with knowledge of the material's molecular structure and fibers, and perhaps the only one with knowledge of how to fabricate the material, then, Zeta may rely on a great deal of Federal Circuit precedent to arrive at precisely the wrong conclusion—that he is the sole inventor.[227] The effort and creativity that Zeta put into the invention may be dwarfed by those of his collaborators, but the logic of *Trovan* analysis, strictly applied, awards him the entire patent right anyway.

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[227] This scenario is not merely fanciful. A federal district court recently misinterpreted the law of joint inventorship in just such a manner in *Vanderbilt Univ. v. ICOS Corp.*, 594 F. Supp. 2d 482 (D. Del. 2009), *aff'd*, 601 F.3d 1297 (Fed. Cir. 2010). Relying on *Burroughs Wellcome* and *American Bioscience*, the district court held that university researchers who had collaborated with a drug company to identify and test a series of pharmaceuticals could not be joint inventors because none of the university scientists had "conceived the 'specific chemical structure of the compound' claimed." *Id.* at 505. Although the court recognized that the university researchers must have made a valuable contribution to the discovery of the patented compounds and found the drug company's denial of benefit from the university "troubling," it could find no basis in law for treating the university scientists as joint inventors even if they contributed the very scaffolding of the drug. *Id.* at 505-07.

Judge Clevenger, writing for a panel of the Federal Circuit, corrected this error by pointing out that every coinventor need not individually conceive the final and entire invention; someone in the "inventorship team" need merely conceive the complete and final invention. Vanderbilt Univ. v. ICOS Corp., 601 F.3d 1297, 1306-07 (Fed. Cir. 2010). Yet, relying on the facts on record which were tainted by the trial court's misunderstanding of the law, the Federal Circuit affirmed the district court opinion despite the absence of a sufficiently developed record based on a proper interpretation of the law, *id.* at 1307-08, an unfortunate choice, as Judge Dyk pointed out in dissent, *id.* at 1310 (Dyk, J., dissenting in part). This outcome results mainly from a jurisprudential problem already discussed—the Federal Circuit treating inventorship as a question of law rather than a question of fact.

This problem does not arise as readily in patents covering mechanical devices or processes, because a coinventor will usually have contributed an identifiable physical component to a device or a step to a process. For example, in *Ethicon v. U.S. Surgical Corp.*, the alleged coinventor of surgical trocar could point to a specific safety means limitation, incorporated into the relevant claim, that he contributed to the trocar.[228] Moreover, mechanical device patents frequently specify their utility in the claims themselves,[229] so a collaborator's contribution to utility would survive *Trovan* analysis. But no great imagination is required to envision hypothetical cases posing the same problem in the mechanical engineering field. For example, a novel device invented by Iago may be obvious over the prior art until Charles discovers a nonobvious use for the device.[230] Or a novel manufacturing process invented by Ilsa may be nonfunctioning when applied to certain materials, but if Calvin discovers that the process functions well when applied to a nonobvious choice of materials, Calvin is a coinventor. The inventive contributions of Charles and Calvin rendered their respective inventions patentable, but those contributions need not appear in the claims.

The arbitrary exclusion of some inventors caused by overreliance on the claims creates special problems in materials, chemical, and pharmaceutical development. As noted, patents in these fields typically claim the compound itself with no mention of its utility. Discussion of utility is relegated to the written description portion of the patent for such inventions.[231] Claims that omit any mention of the invention's utility, or the method of making and using it, highlight the merely partial role played by the claims as a definition of the invention. They

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[228] Ethicon, Inc. v. U.S. Surgical Corp., 135 F.3d 1456, 1463 (Fed. Cir. 1998).

[229] *E.g.*, U.S. Pat. No. 7,975,315 (July 5, 2011) ("The present invention relates to an atomic force microscope . . . ."); U.S. Pat. No. U.S. Pat. No. 7,947,218 (May 24, 2011) ("The present invention relates to a portable cooling device . . . that provides air flow, and a shroud . . . at an article . . . .").

[230] Many device patents do omit any mention of utility from the claims. *See, e.g.*, U.S. Pat. No. 7,947,349 (May 24, 2011) ("The invention relates to a moulded piece forming a negative mould . . . .").

[231] *See, e.g.*, U.S. Pat. No. 7,973,166 (July 5, 2011) (claim 1); U.S. Pat. No. 6,740,654 (May 25, 2004) (claims 1-20); U.S. Pat. No. 5,972,658 (Oct. 26, 1999) (claims 1-8); U.S. Pat. No. 4,024,272 (May 17, 1977) (claims 1-9, 12-20). European practice is consonant. *See* Mobil Oil/Friction Reducing Additive, Eur. Pat. Off. Bd. App. Case No. G 0002/88, para. 5 (Dec. 11, 1989), [1990] E.P.O.R. 73 ("The discovered use of [a] compound or composition will normally be described in the patent, but may not be expressly claimed.").

also prevent a collaborator who discovers a compound's utility from qualifying as an inventor under a strict *Trovan* analysis.

Pharmaceutical inventions illustrate this point with special aptness. In developing a new pharmaceutical invention, the scientific problem is not to create a novel compound in a vacuum. A pharmaceutical compound, once created, does not "do" anything; it has no utility outside of its target biological organism. In order for a patent covering such a compound to issue, the applicant must credibly allege that the compound has some biochemical effect on a target organism. In other words, a pharmaceutical compound is not a functioning invention until introduced into its target organism. The claims, to the extent that they merely recite some molecular structure without mention of a therapeutic utility, limit the patentable scope of the invention but cannot "define" it in any meaningful sense.

The incomplete role of the claims in "defining" pharmaceutical inventions reveals its significance clearly in any description of the inventive process. The process of conceiving and synthesizing the claimed compound is often a relatively small part of drug design. In order to complete conception of the compound through trial-and-error testing, the inventors may need to perform all of the following steps: (1) understand the biological mechanism or agent causing the disorder; (2) select or develop a target chemical molecule ("candidate") potentially capable of treating the disorder; (3) develop an efficient method for producing the candidate on a mass scale; (4) develop or select a series of systems for screening the candidate against the biological mechanism, or an environment that simulates the mechanism; and (5) modify the candidate as needed to increase its potency; reduce toxicity, side effects, or contraindications; reduce the molecular half-life; and determine proper dosage and delivery method.[232] As a result, pharmaceutical inventions usually result from team research involving biologists, biochemists, medicinal chemists, and pharmacologists performing different tasks.

Inventors may have contributed to any of these steps. In some cases, the biological mechanism underlying the disorder to be treated may be well understood in the art, but the kind of molecule that will remedy the biological disorder will be

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[232] *See generally* Shayne Cox Gad, *Introduction: Drug Discovery in the 21st Century*, *in* DRUG DISCOVERY HANDBOOK 1, 1-7 (Shayne C. God ed., 2005). In rational drug design, the use of computer modeling may eliminate the need for and reduce reliance on some of these steps. *See generally* ULF MADSEN, POVL KROGSGAARD-LARSEN & TOMMY LILJEFORS, TEXTBOOK OF DRUG DESIGN AND DISCOVERY (2002).

the subject of uncertainty. In other cases, the biological mechanism will be mysterious or misunderstood, and the conception of the invention may require unique insights into the biological source of the disorder. The latter class of inventions is by far the most challenging to develop and perfect; all pharmaceutical inventions require the selection, testing, and possible modification of a bioactive compound, but not all require extensive original research into human or other animal biochemical functioning. Yet, because the claims will typically recite only the chemical structure of the molecule, an inflexible *Trovan*-type analysis would arbitrarily privilege the second and fifth steps over the others, despite the fact that in any given case the former may require the least effort, expertise, creativity, or other inventive contribution.[233]

2. *Restoring Incentives for Collaborative Research*

Claim fixation results in an inventorship analysis obviously inequitable to the excluded inventors, but it also poses a threat to collaborative research. Often, private companies seek to collaborate with university scientists and engineers to develop innovative products. For example, drug developers frequently collaborate with university biologists and chemists to discover diagnostics and treatments for persistent human diseases and disorders. University researchers are typically involved in exploring human or other animal biology or biochemistry, while the drug companies have expertise in medicinal chemistry and pharmacology. In such collaboration, *Trovan* analysis seems to suggest that the university researchers could never qualify as inventors if they did not contribute some specific molecular arrangement to the claimed compound. The patent incentive to collaboration with drug companies disappears.

An interesting illustration of the flaws in *Trovan* analysis occurred in a previously mentioned case, *Board of Education ex rel. Florida State University v. American Bioscience*.[234] There, FSU scientists and their post-doctoral fellow, Dr. Tao, had been experimenting with variants of paclitaxel, a naturally-occurring

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[233] For example, the fifth step typically requires repeated recourse to the system developed in step 4, in order to verify that the modifications of the molecule perform the function desired in an acceptable manner. In any given case, the inventors may be able to use a prior art, off-the-shelf assay system to test and modify a nonobvious compound, or they may have to develop a nonobvious system for testing and modifying a prior art compound. Either step may constitute a valid contribution to conception.

[234] Bd. of Educ. *ex rel.* Bd. Of Trustees of Fla. State Univ. v. Am. Bioscience, Inc., 333 F.3d 1330 (Fed. Cir. 2003).

anticancer compound. At the FSU lab, Tao learned a "semi-synthetic" process for producing paclitaxel analogs. During this time, FSU scientists undertook a research project to develop nitro-taxols as chemotherapeutic radiosensitizing taxanes. Within a relatively short time, the FSU scientists discovered that a specific compound they had synthesized, PNIP, showed promise as a radiosensitizing agent. One of the FSU scientists (Dr. Nadizadeh) had developed a "secret" method for synthesizing PNIP, of which Tao was informed.

At some point during this research, one of the FSU scientists spoke at a conference regarding the synthesis of paclitaxel. Scientists at a pharmaceutical developer, VivoRx, had attended and decided to start researching radiosensitizing agents using a variant of paclitaxel, known generically as docetaxel, as the parent structure. Soon after having begun research, VivoRx hired Tao to assist in the project, and with his help in synthesizing compounds (allegedly using Nadizadeh's secret method of making nitro-taxols), VivoRx obtained patents on several docetaxel analogs.

In evaluating whether any FSU scientists qualified as joint inventors of the patented compounds, the Federal Circuit discounted FSU's experimental work: "general knowledge regarding the anticipated biological properties of groups of complex chemical compounds is insufficient to confer inventorship status with respect to specifically claimed compounds."[235] The court then observed that "invention does require conception, and there is no evidence that FSU's inventors conceived any *of the claimed compounds*."[236] With regard to the use of FSU's methods to make the compounds, the court concluded that this was irrelevant, because the patent did not claim the method of making the compounds.[237] Specifically, FSU alleged that Tao had used Nadizadeh's secret method to synthesize the patented compounds. To this, the court replied:

> despite the fact that Nadizadeh may have developed a method of making PNIP and other taxol derivatives, the record in the present case indicates that he did not conceive the claimed compounds; only ABI's inventors were in possession of both the structure of the

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[235] *Id.* at 1340.

[236] *Id.* (emphasis added). Throughout this portion of the opinion, the court repeated and elaborated on the mistaken conclusion that the FSU scientists had to conceive the entire compounds to be joint inventors. *Id.* at 1340-42.

[237] *Id.* at 1341.

> claimed compounds and an operative method of making those compounds.[238]

Although the court acknowledged that conception of an invention requires disclosure of the method of making it, it held that the inventor of the method could not be a coinventor of the compounds made by his method unless he "conceive[d] of the claimed compounds" himself.[239]

The *American Bioscience* court's focus on the "claimed compounds" and discounting of the (unclaimed) method of making them is symptomatic of claims fixation. Whether FSU scientists conceived of an entire claimed compound is not the pertinent question; the patented compounds were conceived by at least *some* of the inventors. The FSU scientists need only have contributed to the conception of the invention in some way; conception of the entire compound by any specific inventor is entirely irrelevant, as long as the research team collectively conceived the claimed compounds.

A proper analysis of inventorship would have acknowledged that the contribution of necessary background biological knowledge, useful suggestions for functional groups of the claimed compounds, and techniques for making the compounds, could all qualify the contributors as coinventors if the contributors had collaborated with the VivoRx team and satisfied the three *Pannu* conditions of coinventorship. Under this analysis, it is possible that some of the FSU scientists would not have qualified as joint inventors. It is also possible that some would have qualified. The court's repeated distortion of the law of inventorship in the case did considerable mischief on the facts before it, where FSU scientists who may have contributed substantially to the VivoRx inventions were excluded from consideration as joint inventors. In effect, the Federal Circuit sanctioned what may have been the misappropriation of a university's valuable research, gathered over the course of many years, by a private company that promptly commercialized it for its own benefit and the preemption of any benefit by the university scientists. More troubling still, the decision has had a predictably perverse effect on the development of joint inventorship doctrine. For example, it misled the district court in *Vanderbilt University v. ICOS Corp.* into concluding that failure of any

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[238] *Id.* at 1342.
[239] *Id.*

alleged collaborator to independently conceive of the entire claimed invention negated any possibility of joint inventorship.[240]

Very recently, the Federal Circuit has retreated from the *American Bioscience* reasoning and partially rectified the wayward doctrine. In *Falana v. Kent State University*, the plaintiff, a university researcher, developed an original method of making certain compounds for use in liquid crystal displays.[241] After the plaintiff (Dr. Falana) left the university's employment, his supervisor used Falana's method to synthesize a compound that he patented without naming Falana as a coinventor. The university read *American Bioscience* to dictate that, because it had not sought to patent Falana's method, and Falana had never conceived the patented compounds, he was not a coinventor of any compound resulting from the use of his method.

The Federal Circuit disagreed with this understanding of *American Bioscience*.[242] Actually, the university's reading of the case was quite reasonable. The *American Bioscience* opinion was plainly dismissive of a researcher who had contributed a method of making the patented compound without conceiving of the compound itself. To get past *American Bioscience* without reversing itself, the court had to somehow reconcile its own holding with the fact that Dr. Falana, like Dr. Nadizadeh in *American Bioscience*, had never made or seen the university's patented compounds.

To do this, the court resorted to the time-honored tactic of distinguishing the cases on the facts. In *American Bioscience*, Nadizadeh never actually worked with the patentee's inventive team directly; he worked with Tao, who in turn worked with the patentee to develop the compound. In *Falana*, the eponymous plaintiff worked directly with the university research team, although he left before the compound was discovered. This distinction is, of course, irrelevant; the Patent Act does not require that all joint inventors work together, merely that they are exposed to each other's work in the course of some cooperative enterprise.

The *Falana* court also suggested that, in *American Bioscience*, Nadizadeh had simply "taught skills or general methods" that merely facilitated the later

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[240] *Vanderbilt Univ. v. ICOS Corp.*, 594 F. Supp. 2d 482, 504-06 (D. Del. 2009), *aff'd*, 601 F.3d 1297 (Fed. Cir. 2010).

[241] Falana v. Kent State Univ., 669 F.3d 1349, 1358 (Fed. Cir. 2012)

[242] *Id.* at 1357.

invention "without more."[243] But this too is irrelevant; the operative question is whether the skills and methods taught by the collaborator (a) contributed more than well-known principles, and (b) made a significant contribution (c) to conception. As the court itself recognized in *Falana*, "Where the method requires more than the exercise of ordinary skill . . . the discovery of that method is as much a contribution to the compound as the discovery of the compound itself."[244] Problematic as the distinction between the cases may be, it is salutary that the Federal Circuit is beginning to perceive a more accurate concept of invention. The misfortune is that, in not reversing the mistakes of *American Bioscience* unambiguously, the court leaves standing contradictory approaches to the role of claims in determining inventorship.

Also problematical is the potential of claims-fixation to lead to an oxymoronic "inventorless invention." A slight extension of scenario {3} demonstrates how this paradox might arise:

{4} Eta, Theta, and Iota are collaborating to discover a cure for lung cancer. Through diligent and unusually insightful research, Eta discovers a hitherto unknown biochemical mechanism that makes cancer cells susceptible to certain kinds of polypeptides. Theta invests several months into creating a series of nonobvious screening systems for testing compounds against the discovered vulnerability in cancer cells. Together, Eta and Theta propose to Iota, a medicinal chemist, the characteristics that such a compound should have. Following these instructions, Iota pulls a well-known drug compound off his shelf, modifies it into a series of novel derivative compounds using well known techniques, and runs them through Theta's screening systems. One of the derivative compounds turns out to be a wonder drug that cures lung cancer with a very high probability in humans. Together, they seek a patent on the compound only.

Under the facts of scenario {4}, neither Eta nor Theta ever pictured in their minds the finished compound. Nor did they contribute any specific physical structure to the claimed molecule. They lacked the requisite knowledge of medicinal chemistry to do so. Neither Eta nor Theta would be coinventors under a strict *Trovan* analysis or the *American Bioscience* approach, because none of their contributions appear in the claims. Iota synthesized the patented molecule, and

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[243] *Id.* at 1358.
[244] *Id.*.

was the first and only collaborator to conceive it in his mind, but nothing in his contribution exceeded the state of the art of medicinal chemistry. His work was the least inventive of the three, and arguably did not rise to a contribution to conception. If the claims merely recite the molecular structure of the claimed compound, the result will be that an invention of undoubted novelty, nonobviousness, and utility, might have *no inventor at all*.[245] Under an expansive interpretation of *Trovan*, the cure for cancer described in scenario {4} could well be doctrinally unpatentable.[246] The result is diametrically opposite to any patent policy of encouraging collaborative research and the equitable sharing of its benefits.

## CONCLUSION

The argument of this Article—that the concept of invention and inventorship has been erroneously construed as "defined" by the claims—has relied on an argument sufficiently complex to proceed in stages. First, I showed that the invention cannot be defined by the claims, because the claims do not necessarily express all the prerequisites for a patentable invention. These omitted elements include most typically utility, a method for making the invention, and a method for using the invention. Without these, no novel and nonobvious product or process has yet attained the status of an "invention" ready for patenting. Therefore, a research collaborator who contributes one or more of these aspects to an invention qualifies as a co-inventor even if his contribution does not appear in the claims. Moreover, treating the claims as defining the invention contradicts both the unity of invention rule and the rationale underlying the doctrine of equivalents. The *Trovan* sequence of analysis relied upon by the Federal Circuit consequently cannot be the only valid method for determining inventorship.

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[245] *But see* William R. Thropp & Sons Co. v. De Laski & Thropp Circular Woven Tire Co., 226 F. 941, 949 (3d Cir. 1915) ("One may conceive a general or imperfect outline of an entirely novel thing, which, without the conception of another developing it and giving it body, might never amount to invention; but if the conceptions of one supplement and complement the conceptions of the other, the result might be invention and therefore joint invention.").

[246] In practice, a court might stretch the law to cover this case through the judicial fiction that Eta and Theta "conceived" the compound by producing all the information required to lead a person having ordinary skill in the art to the compound. However, *Trovan* analysis in no way sanctions such an interpretation of inventorship, which illustrates again how *Trovan* crams inventorship analysis into a Procrustean bed. Trovan, Ltd. v. Sokymat S.A., Irori, 299 F.3d 1292, 1302 (Fed. Cir. 2002).

Second, I explained how the consequences of fixating on the claims undermined Congress' clearly expressed intentions in amending Section 116 of the Patent Act to encourage collaborative technological research. Third, I discussed the aggravating effects of two erroneous and contradictory doctrines adopted by courts: (a) the strong presumption of validity accorded to all aspects of an issued patent, regardless of whether the PTO examined the aspect at issue, and (b) the treatment of inventorship as a question of law. Finally, I suggested how inventorship doctrine could be rectified, most generally by treating the claims as defining the outward limits of patent protection for the invention rather defining than the invention itself. Procedurally, courts should hew to *Falana* analysis and resort to *Trovan* analysis only when the alleged co-inventor's sole contribution appears *expressis verbis* in the claims.

Until the Supreme Court or Federal Circuit decisively clarifies the distinction between the invention and the claims, and the role of joint inventors in the former, the law of inventorship will continue to impose unnecessary costs on collaborative research and to skew inventorship determinations in favor of legally sophisticated but unprincipled researchers to the disadvantage of their less urbane collaborators. The problems resulting from claim fixation are further aggravated by adherence to an unjustifiably strong presumption that the persons named as inventors in the patent are the true and only inventors. There is no statutory basis for a strong presumption of validity on matters unexamined by the PTO, and no cogent rationale for judicially imposing a "clear and convincing evidence" standard.

Because all coinventors have equal and nonexclusive ownership rights in the patent by default,[247] the stakes for nonjoinder are potentially very high. Absent an assignment agreement, all inventors own rights to all claims in their patent, regardless of whether they contributed to those claims in any way. The Federal Circuit's decision in *Ethicon* giving inventors ownership rights to claims to which they did not contribute was perhaps inevitable given the unity of invention principle and the phrasing of Sections 116 and 262 of the Patent Act, but it had the unfortunate consequence of increasing the risks of collaborative research outside of an employment contract. Collaborations between private companies, or between research universities and private industry, stand to suffer unnecessarily.

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[247] *See supra* text accompanying notes 144-146.

Any adjustment of the ownership rights in a patent with multiple inventors would best be accomplished legislatively, but many of the current doctrine's ill effects can be remedied by rectifying the wayward judicial conception of the invention. The overwrought fixation on claims and strong presumption of validity in inventorship determinations appear nowhere in the Patent Act. They are progeny of the judiciary and correctible by it. The judicial attitude toward overemphasizing claims should mirror that of Bill Cosby's father to the young Bill: "I brought you into this world, and I can take you out."[248]

[248] BILL COSBY: HIMSELF (20th Century Fox 1983).