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dort geltenden nationalen Recht hervorrufen und würde sodann gegen die Grundsätze von TRIPS verstoßen. Wie vorstehend gesehen, fehlt es vor allem jedoch an der planwidrigen Regelungslücke, was zu einer Auslegung für eine europäische Vorbenutzung entgegen dem Wortlaut führen müsste.[67] Das erschließt sich auch bei einem direkten Vergleich mit der mittelbaren Patentverletzung: Die in Art. 26 EPGÜ geregelte mittelbare Patentverletzung enthält keinen doppelten territorialen Inlandsbezug mehr.[68] Damit stellt das EPGÜ seinem Sinn und Zweck nach nur noch ein *einheitliches Inlandskriterium* auf. Dieser einheitliche Inlandsbezug ist bei Art. 28 EPGÜ aber gerade ausdrücklich nicht erkennbar und soll für den Ausnahmetatbestand der Vorbenutzung daher eben nicht gelten.

3. Gesetzgeberisches Vorhaben

[45] Eine gerichtliche Klärung erscheint daher vor dem Hintergrund geltenden Rechts nicht vielversprechend. Es dürfte insbesondere Aufgabe des Gesetzgebers sein, der hier wünschenswert – jedenfalls für das Einheitspatent – *de lege ferenda* noch nachbessern kann. Denkbar ist etwa die weitestgehend ohne Zeitverlust umsetzbare Revision des EPGÜ durch das Administrative Committee nach Art. 87 Abs. 2 EPGÜ. Diese wurde für die Aufnahme der Zentralkammer in Mailand schon einmal bemüht.[69] Voraussetzung ist natürlich, dass sich das Administrative Committee, bestenfalls in Absprache mit den Vertragsmitgliedstaaten, zuvor auf eine Regelung einigt, die sodann vom Administrative Committee in Hinzunahme eines Art. 28 Abs. 2 EPGÜ in den Vertrag mit Bindung für alle Vertragsmitgliedstaaten aufgenommen wird. Jedenfalls aber sollte die Regelung des Art. 28 Abs. 2 EPGÜ zum Gegenstand einer Revision des Übereinkommens in 7 bzw. 14 Jahren nach Ablauf der „Übergangsphase" sein, mit der das Europäische Patentsystem dauerhaft auf europäische Patente mit einheitlicher Wirkung *umgestellt* wird. Bis dahin dürfte sich auch das Einheitliche Patentgericht mit der Norm befasst haben.

67 Vgl. Schön FS Canaris 2017, 147 (151 ff.) mwN: Der Europäische Gerichtshof hat die hohe Bedeutung von Wortlaut und Wortsinn mehrfach verdeutlicht EuGH EuZW 2004, 188 Rn. 51 – Gasser; EuGH BeckRS 2005, 70952 Rn. 31 – EZB; EuGH DStRE 2007, 1046 – Joustra.
68 Sonntag in Bopp/Kircher, EurPatentprozessHdB, § 13 Rn. 165.
69 Decision of the Administrative Committee under Article 87 (2) UPCA amending the Agreement: D –AC/03/26062023.

JEREMY BALDONI*, TIGRAN GULEDJIAN** AND SARA MILLER***

"I Invented It, But AI Helped": How Certain Joint Inventorship Rules Break Down When Humans And An AI System Work Together To Develop An Invention

Fragen um sog. KI-generierte Erfindungen oder um Erfindungen, die unter Einsatz von KI-Systemen gemacht werden, sind in den USA mindestens ebenso umstritten wie in Deutschland und Europa. Die Diskussion hat die rein wissenschaftliche Ebene allerdings mittlerweile verlassen. Der nachfolgende Beitrag präsentiert die Diskussion im US-amerikanischen Patentrecht mit besonderem Blick auf die jüngsten richterlichen Entscheidungen im sog. Thaler-Fall (zu den auch in Deutschland und Europa diskutierten „DABUS"-Erfindungen vgl. zuletzt etwa Dornis GRUR Patent, 2023, 14). Zudem präsentiert der Beitrag eine weitere interessante Facette: Ein bislang wenig erörterter Aspekt der Problematik offenbart sich in Fällen, in denen KI-generierte Erfindungen oder Erfindungen, die unter Einsatz von KI-Systemen gemacht wurden, bereits vor der Anmeldung zum Patent veröffentlicht wurden. Nach dem auch im US-Recht geltenden Konzept des Ausschlusses der Patentierbarkeit bei fehlender Neuheit, wenn die Erfindung also bereits zum Stand der Technik gehört, besteht unter bestimmten Umständen selbst bei erheblichen genuin menschlichen Erfinderbeiträgen ein Risiko der Unpatentierbarkeit.

In the United States, joint inventorship is "one of the muddiest concepts in the muddy metaphysics of the patent law."[1] Historically, however, one thing had been clear: the "joint inventors" of an invention would be the significant contributors to the conception of that invention, so long as they worked together. Various rules of patent law are premised on this unity of contributors and inventors.

This unity of contributors and inventors recently ended under United States law because the Federal Circuit Court of Appeals ruled, in Thaler v. Vidal, that an AI system cannot be an "inventor," and the Supreme Court declined to take the case.[2] The court based its ruling on "who may be an inventor" – namely, only humans, based on certain statutory language – not "how an invention is made."[3] The court did not rule on whether an AI system can contribute to the conception of an invention.

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1 *Mueller Brass Co. v. Reading Indus., Inc.*, 352 F. Supp. 1357, 1372 (E. D. Pa. 1972), *aff'd*, 487 F.2d 1395 (3d Cir. 1973).
2 *Thaler v. Vidal*, 43 F.4th 1207, 1213 (Fed. Cir. 2022), *cert. denied*, 143 S. Ct. 1783, 215 L. Ed. 2 d 671 (2023).
3 *Id.* at 1212.

A joint inventor now must both (1) make a significant contribution to the conception of the invention; and (2) be a human. Ending the recognition of significant contributors as joint inventors presents challenges for other areas of patent law that were based on the presumption that contributors and inventors are the same. This article addresses ways in which this new dichotomy may create unintended consequences in other areas of patent law.

First, the article introduces an example of a generative AI system that can suggest a design in a way that is similar to a suggestion by a human that has warranted joint inventorship status. If an AI system and a human make similar contributions to an invention, a court might reason that, because one contributor (the AI system) is not entitled to be a joint inventor, the other (the human) should not be entitled to be an inventor either.

Second, the law imposes a murky test for determining joint inventorship, and it requires at least one cognizable inventor for an invention to be patentable. When all significant contributors were deemed joint inventors, the ill-defined standard for a "significant contribution" was relatively harmless because inventorship could generally be corrected without invalidating the patent. This doctrine breaks down if contributors are not necessarily inventors because, for example, an invention could be unpatentable if the human contributors do not ultimately meet the murky standard for a "significant contribution" while an AI contributor does. It may be said that this result contradicts the intent of policymakers; for example, the Patent Act states, "[p]atentability shall not be negated by the manner in which the invention was made."

Third, joint inventors who publish about an invention have one year to file a patent application, without the publication constituting prior art. This rule breaks down if contributors are not necessarily inventors. For example, if a key contributor in a research effort is bound to be on both any publication and any resulting patent application, a research group may publish their results promptly, with the understanding that such publications will not be blocking prior art. However, if an AI system is the key contributor to a research effort that ties the team together, and the murky rules for joint inventorship make it unclear which humans will be inventors on any eventual patent application, a publication made by one human team member and the AI system may end up blocking patentability of the invention if only other humans ultimately qualify as the joint inventors. Policymakers may not have intended that a publication by a significant contributor to an invention would bar patentability of that invention.

I. Introduction

1. The *Thaler* Case

[1] Stephen Thaler, a computer scientist, filed two patent applications with the United States Patent and Trademark Office ("USPTO") listing his AI system – the Device for the Autonomous Bootstrapping of Unified Sentience ("DABUS")[4] – as the sole inventor on each.[5] According to Thaler's applications, DABUS created unique prototypes entirely on its own, two of which were at issue. One was directed to a "light beacon that flashes in a new and inventive manner to attract attention," and the other was directed to a "beverage container based on fractal geometry."[6] In 2022, the United States Court of Appeals for the Federal Circuit ("Federal Circuit") ruled that an AI system cannot be an inventor because it is not a human, agreeing with the USPTO's interpretation that the term "individual" as used in the definition for "inventor" in the Patent Act only applies to natural persons.[7] The Federal Circuit rejected policy arguments in favor of granting Thaler's applications and instead focused on statutory interpretation of the Patent Act and deference to Congress's power to enact legislation regarding patent law.[8] In 2023, the U.S. Supreme Court declined to hear the case. Thus, under current United States law, no patent may be granted on an application where only an AI system is listed as the inventor, and a patent can be invalidated on a showing that the only proper inventor on a patent is an AI system.[9]

[2] The reaction to *Thaler* was swift and forceful; however, commentators offered widely divergent views of the decision's correctness and effect. Some concluded that *Thaler* was wrongly decided, and that it improperly rendered AI-generated inventions entirely unpatentable. They argued that this result poses great danger to innovation and the U.S. economy.[10] Others argued that, under *Thaler*, a human

4 *See id.* at 1209-10 ("Thaler provided a supplemental 'Statement of Inventorship' explaining that DABUS was a 'particular type of connectionist artificial intelligence' called a 'Creativity Machine.'") (citation omitted).
5 *Id.*
6 *See Thaler v. Hirshfeld*, 558 F. Supp. 3d 238, 241 (E.D.Va. 2021), *aff'd sub nom. Thaler v. Vidal*, 43 F.4th 1207 (Fed. Cir. 2022), *cert. denied*, 143 S.Ct. 1783 (2023) (citations omitted).
7 *Thaler*, 43 F.4th 1207 at 1213.
8 *See id.* ("Here, Congress has determined that only a natural person can be an inventor, so AI cannot be.").
9 Thaler filed similar applications in other jurisdictions, including Australia, the European Patent Office, Germany, Israel, New Zealand, South Africa, South Korea, and the United Kingdom. *See* Kingsley Egbuonu, *The latest news on the DABUS patent case*, IP Stars (July 11, 2023). Those applications have generally been unsuccessful. *See* Dan L. Burk, Causation and Conception in American Inventorship, 21 Duke L. & Tech. Rev. 116, 116, 117 n. 6 (Mar. 26 2023) ("Courts and administrators around the world who have reviewed such applications [for purported inventions in which an AI system was the inventor] have overwhelmingly rejected them, repeatedly holding that their organic statutory or treaty authority extends patent inventorship only to human applicants... . The sole exception to date of this global consensus is the patent registration system in South Africa, which does not examine patent applications, and so issued a patent to a machine as inventor without meaningful review.").
10 *See, e.g.*, Brief of Lawrence Lessig et al. as Amici Curiae Supporting Petitioner at 16, *Thaler*, 143 S.Ct. 1783 (No. 22-919) at 3, 5 ("Because it completely deprives an entire class of important and potentially life-saving patentable inventions of any protections, the Federal Circuit's affirmance of the U.S. Patent and Trademark Office's denial of a patent to Dr. Stephen L. Thaler as the owner of an artificial intelligence system jeopardizes billions in current and future investments, threatens U.S. competitiveness and reaches a result at odds with the plain language of the Patent Act and this Court's tradition of interpreting the Patent Act in a manner friendly to new technology and innovation... . Absent this Court's review, the USPTO will invalidate all AI-generated inventions until Congress acts.").

would still qualify as an inventor for AI-generated inventions, and thus no crisis of patentability exists for such inventions.[11] A third group argued that AI systems cannot yet invent, but any changes to patent doctrine should be made cautiously given the risk of potential unintended consequences.[12]

[3] *Thaler* left much to be resolved. Notably, because the patent applications at issue in *Thaler* listed a single inventor (an AI system), the court did not confront how inventorship should be decided when an AI system and humans both contributed to an invention.[13] In practice, AI systems are built and operated by people, and thus the issue that matters most is what happens when humans and AI systems work together to develop an invention.

2. United States law on inventorship, joint inventorship, and conception

[4] "A valid patent requires correct inventorship."[14] The requirement that a patent properly list the inventors is based, in part, on the Constitution, which grants Congress the power to "secur[e] for limited Times … Inventors the exclusive Right to their respective … Discoveries."[15] The Patent Act passed by Congress, in turn, allows patents to be granted specifically to "[w]hoever invents or discovers" a patentable invention.[16] Generally, a non-provisional patent application must include "the name of the inventor for any invention claimed in the application,"[17] and each inventor must submit with the application an oath or declaration that contains a statement that "such individual believes himself or herself to be the original inventor or an original joint inventor of a claimed invention in the application."[18] Neither the Constitution nor the Patent Act contains any substantive definition of "inventor"; thus, standards for inventorship have been developed through case law.[19] The Patent Act recognizes that an invention may have multiple inventors – i. e., "joint inventors" – and it provides that joint inventors need not make "the same type or amount of contribution."[20]

[5] Case law provides that "the 'inventor' is the person who conceived of the invention."[21] Accordingly, determining whether someone is an inventor depends primarily on whether that person "conceived" of the invention. "Conception is the touchstone of invention … , and it requires a definite and permanent idea of an operative invention, including every feature of the subject matter sought to be patented … . An idea is definite and permanent when the inventor has a specific, settled idea, a particular solution to the problem at hand, not just a general goal or research plan."[22] This often-cited standard generally applies when determining sole inventorship.

[6] The standards governing joint inventorship are murkier. As one treatise put it: "Overall, the legal rules that relate to the determination of joint invention are complex and incompletely thought out. As a re-

11 *See, e. g.*, Burk *supra* note 9 at 125 ("One of the humans surrounding the machine, particularly the user, is likely to be the one to conceive of the AI's output as an invention … ."); David L. Schwartz & Max Rogers, "Inventorless" Inventions? The Constitutional Conundrum of *AI*-Produced Inventions, 35 Harv. J. L. & Tech. 531, 569 (2022) ("[T]he Patent Act permits an individual who is not the creator (at least in any colloquial sense) of a claimed invention to nevertheless claim inventorship… .").

12 *See, e. g.*, Novartis Comments on Artificial Intelligence and Inventorship at 1 (Docket PTO–P–2022–0045, 88 FR 9492) (May 15, 2023) ("AI is not currently 'inventing' in the human sense, or in the sense that United States patent law contemplates."); Microsoft Comments In Response to USPTO Request for Comments Regarding Artificial Intelligence and Inventorship at 6 (Docket No. PTO-P-2022-0045) (May 15, 2023) ("To our knowledge, AI systems have not made contributions to an invention at the same level as a human who would be considered an inventor."); AIPLA Comments In Response to the Request for Comments on Request for Comments Regarding Artificial Intelligence and Inventorship at 8, 88 Fed. Reg. 9492 (requested Feb. 14, 2023) Docket No.: PTO-P-2022-0045 ("Expanding the guidance on inventorship to include AI systems could potentially diminish the importance of inventors and lead to unintended consequences in the development and protection of intellectual property.").

13 *See Thaler*, 43 F.4th at 1213 ("[W]e are not confronted today with the question of whether inventions made by human beings with the assistance of AI are eligible for patent protection.").

14 *In re VerHoef*, 888 F.3d 1362, 1365 (Fed. Cir. 2018), *as amended* (May 7, 2018).

15 *See* U. S. Const. art. I, § 8, cl. 8 ("[The Congress shall have Power] To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."). Notably, two scholars have concluded that Congress may constitutionally deem as an inventor a person associated with an AI-generated invention, even if the person did not literally create the invention. *See* Schwartz & Rogers, *supra* note 11 at 578 (2022) ("We do conclude … that various natural persons could be deemed the inventor of an AI-produced invention consistent with the limits of the Constitution. As our historical analysis of the Intellectual Property Clause indicated, inventorship at common law was not limited to the literal creator of a claimed invention. Rather, 'Inventors' also encompassed individuals who first made an invention available to the public, such as the first importer of overseas technology.").

16 *See* 35 U. S. C. A. § 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 … ."); 35 U. S. C. A. § 100(f) ("'inventor' means the individual or, if a joint invention, the individuals collectively who invented or discovered the subject matter of the invention").

17 35 U. S. C. § 115.

18 35 U. S. C. § 115(b)(2).

19 *See* R. Carl Moy, 3 Moy's Walker on Patents § 10:10 (4th ed.) ("[T]he law has had to develop a definition of inventorship by case law decision.").

20 *See* 35 U. S. C. § 116 ("When an invention is made by two or more persons jointly, they shall apply for patent jointly and each make the required oath, except as otherwise provided in this title. Inventors may apply for a patent jointly even though (1) they did not physically work together or at the same time, (2) each did not make the same type or amount of contribution, or (3) each did not make a contribution to the subject matter of every claim of the patent."); 35 U. S. C. § 100 ("The terms 'joint inventor' and 'coinventor' mean any 1 of the individuals who invented or discovered the subject matter of a joint invention.").

21 *Ohio Willow Wood Co. v. Alps S., LLC*, 735 F.3d 1333, 1350 (Fed. Cir. 2013); *see also* Sewall v. Walters, 21 F.3d 411, 415 (Fed. Cir. 1994) ("Determining 'inventorship' is nothing more than determining who conceived the subject matter at issue… .").

22 *In re VerHoef*, 888 F.3d at 1366 (citations omitted); *see also Univ. of Pittsburgh of Commonwealth Sys. Of Higher Educ. V. Hedrick*, 573 F.3d 1290, 1297-98 (Fed. Cir. 2009) ("Conception is the touchstone of inventorship under 35 U. S. C. § 116. It is '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.' … . The test for conception is whether the inventor had an idea that was definite and permanent enough that one skilled in the art could understand the invention… .") (citations omitted); *Invitrogen Corp. v. Clontech Lab'ys, Inc.*, 429 F.3d 1052, 1063 (Fed. Cir. 2005) ("[Conception] is 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.' … An idea is sufficiently definite and permanent for conception if it provides one skilled in the art with enough guidance to 'understand the invention,' that is, 'when the inventor has a specific, settled idea, a particular solution to the problem at hand, not just a general goal or research plan he hopes to pursue.' … . The inventor must be able to 'describe his invention with particularity.'… This requires both (1) the idea of the invention's structure and (2) possession of an operative method of making it.") (citations omitted).

sult, the cases in the area display poor predictability generally."[23]

[7] While cases cite a variety of standards for joint inventorship, the standard set forth by one recent appellate case is representative:

[8] "To be a joint inventor, one must:

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

[9] There is no explicit lower limit on the quantum or quality of inventive contribution required for a person to qualify as a joint inventor."[24]

[10] Other cases make clear that a joint inventor must contribute to the *conception* of the invention; contributing only to the reduction to practice does not suffice.[25] Joint inventors must also have worked on the invention collaboratively.[26]

[11] Notably, the standards for sole inventorship and joint inventorship do not cleanly mesh. For example, the significant contributions made by each of two joint inventors may suffice to establish joint inventorship by each of them, but the sum of those two significant contributions may be less than the standard for sole inventorship, if only one person were the inventor of the same thing, because those contributions may collectively not include a "definite and permanent idea of an operative invention, including every feature of the subject matter sought to be patented."[27] In the context of inventive work with AI systems, this may mean that two or more humans working with an AI system may have an easier time establishing their inventorship (because they need only show a significant contribution by each), than if only one human were working with the AI system (because that human would have to reach the higher standard for sole inventorship). This leads to the potentially odd result that, if a human incorporates an AI system's contribution into her invention, but she does not understand some portion of that contribution, she may not be able to patent the invention herself (because she might not reach the sole inventorship standard), but if she finds another human to add another significant contribution to the invention, the two humans could patent it together as joint inventors.

II. Generative design: an example of an AI system's contribution to innovation

[12] It is difficult to generalize how AI systems and humans can work together to develop an invention because there are countless types of and applications for AI systems. However, two analogous examples illustrate how humans and an AI system may work together and contribute to an invention in similar ways. The first example involves only humans; the second involves humans working with an AI system.

[13] First, in the case *In re VerHoef*,[28] Mr. VerHoef's dog, Reilly, had trouble walking after surgery. "Reilly would drag his hind paw and put weight on his paw's knuckles, called 'knuckling.'"[29] Mr. VerHoef sought a solution. He consulted a veterinarian, Dr. Lamb, who suggested a "commercially available harness that would provide support to the hind leg."[30] That did not work. Mr. VerHoef constructed a similar harness, but that also did not work. "VerHoef then recognized that the harness would work better if connected to the dog's toes," and he discussed this with Dr. Lamb.[31] "Dr. Lamb suggested that a strap configured in a figure-eight that fit around the toes and wrapped around the lower part of the leg, above the paw, might be something to consider."[32] This structure ultimately worked and the idea was incorporated into a patent application. The court ruled that Dr. Lamb was entitled to be a joint inventor "because she contributed the idea of the figure[-]eight loop, and the figure eight loop is an essential feature of the claimed invention."[33]

[14] Another example involves a commercially available "generative design" AI tool that can generate proposed structures given specified design constraints. Specifically, in an article by the maker of one such tool,[34] a project manager at Toyota, Shinsuke Omori, explained how his team used the tool to design a

23 Moy's Walker on Patents *supra* note 19 at § 10:23.
24 *Dana-Farber Cancer Inst., Inc. v. Ono Pharm. Co.*, 964 F.3d 1365, 1371 (Fed. Cir. 2020) (citations and internal quotation marks omitted).
25 *See Vanderbilt Univ. v. ICOS Corp.*, 601 F.3d 1297, 1303 (Fed. Cir. 2010) ("A person must contribute to the conception of the claimed invention to qualify as a joint inventor … . Yet, each contributor need not have their own contemporaneous picture of the final claimed invention in order to qualify as joint inventors… . Rather, 'the qualitative contribution of each collaborator is the key—each inventor must contribute to the joint arrival at a definite and permanent idea of the invention as it will be used in practice.'").
26 Scholars disagree about whether an AI system and a human can "collaborate" in the sense required to be joint inventors. *Compare* Ryan Abbott, I Think, Therefore I Invent: Creative Computers and the Future of Patent Law, 57 B. C. L. Rev. 1079, 1095 (2016) ("If the process of developing the Creativity Machine's Patent had been a back-and-forth process with both the AI and Dr. Thaler contributing to conception, then both might qualify as inventors.") *with* Dan L. Burk, *supra* note 9 at 129 ("Machine learning systems (and other automated or non-automated devices) are not collaborative, aware, or capable of intent of any kind.").
27 This inconsistency may be explained by the histories of the two doctrines: the sole inventorship doctrine has largely arisen out of cases about *when* an invention was conceived, to determine who invented first, whereas joint inventorship doctrine is primarily concerned with *who* conceived of the invention.
28 888 F.3d 1362 (Fed. Cir. 2018), as amended (May 7, 2018).
29 *Id.* at 1364.
30 *Id.*
31 *Id.*
32 *Id.*
33 *Id.* at 1366.
34 Yasuo Matsunaka, *Toyota Brings a Generative Design Seat Frame to the Next Level With AI*, autodesk (May 2, 2023), https://www.autodesk.com/design-make/articles/generative-design-seat-frame.

potential new car seat. First, the Toyota team provided design requirements to the tool. Mr. Omori stated that the tool's output was "often completely unexpected at first… . But we took it further and made slight modifications as we went along." Mr. Omori said that the AI system "could come up with shapes that human designers would never have thought of, yet the requirements are met, so the cars are light and strong." The article depicts both the design suggested by the AI tool and the ultimate design after modification by human designers. While the article does not reference any specific invention or patent, this example illustrates that humans and an AI system can work together to make contributions toward a new design for an innovative product, and an AI system can contribute new suggested structures to such a product.

[15] In both *In re VerHoef* and the Toyota example, a design problem was posed by an original human designer, and a contributor suggested a discrete structure as a solution. Dr. Lamb was asked about a harness design that would lift a dog's toes; she suggested a figure-eight structure. Toyota's AI tool was asked for a design that would reduce seat thickness while maintaining other parameters, such as strength and rigidity; the AI system suggested a seat back comprised of a triangular lattice with a thick outer rim, held up by a spine-like truss structure.[35] In both instances, the original human designer apparently had to do significant additional work to incorporate the suggested structure into a complete, working design.

[16] It takes little imagination to envision a scenario in which an AI system has contributed as much to an invention as a human who has been recognized as an inventor. If Mr. VerHoef had consulted a generative AI design tool, instead of Dr. Lamb, perhaps the generative AI tool would have suggested a structure that worked, just like Dr. Lamb did. Under this hypothetical, the AI tool arguably made a significant contribution to the conception of the invention (though it still could not be an inventor under *Thaler*, because it is not a human).

[17] A court could face a situation in which a patent includes claims covering two similar, alternative structures, where one was suggested by a human collaborator, and another was suggested by an AI system. The court might be tempted to consider both designs not "significant contributions" to the inventions, simply because an AI system generated one of the designs. For example, a court might improperly reason: if an AI system came up with one of the designs, the designs must not be inventive, because AI systems are not inventive enough to contribute to the conception of an invention. However, this reasoning assumes that contributions made by an AI system cannot be "significant" to the conception of an invention. *Thaler* only held that an AI system cannot be an inventor because it is not a human; it did not rule that AI systems cannot invent or contribute to an invention. Thus, whether an AI system can contribute in the same or in an analogous way to a human's contribution is arguably irrelevant, under *Thaler*, to determining inventorship by a human.

III. Inventorless inventions: If humans contributed relatively little to an AI-generated invention, is the idea patentable?

[18] When an AI system is used to help develop an invention, in some cases, no individual human may have contributed enough to be considered an inventor under traditional standards. This issue has garnered significant attention, and such situations are often referred to as "inventorless inventions"[36] because the invention may be left without a cognizable inventor. Whether such inventions are patentable, and if so, who would qualify as an inventor, remain open questions.

[19] In *Thaler*, the patent applicant listed no human inventor; thus, the court did not need to decide whether a human who contributed some small amount to a largely AI-generated invention would be entitled to be an inventor. Now, under the rule of *Thaler*, applicants will likely include at least one human inventor, even if that person contributed relatively little to the invention, because a patent application without a human inventor will be denied.

[20] If the only listed inventor on a patent is a human with minimal substantive involvement with the invention, an accused infringer may assert that the patent is invalid based on incorrect inventorship because the listed inventor did not make any "significant" contribution to the conception of the invention; instead, an AI system did all the work. This situation raises the question: is some human necessarily entitled to be an inventor on an AI-generated invention, even if the human contributed relatively little to the invention? Views on this issue among scholars, commentators, and litigants are widely divergent.

[21] *First*, some argue that, under current doctrine, AI-generated inventions are entirely unpatentable. Under this view, if no human really "invented" – i. e., came up with – the invention, and an AI system cannot be an inventor (because it is not a human), then there can be no named inventor on the patent. Since naming an inventor is a prerequisite to patentability, such AI-generated inventions would be unpatentable.

35 Id.

36 *See, e. g.*, Tim W. Dornis, *Artificial Intelligence and Innovation: The End of Patent Law As We Know It*, 23 Yale J. L. & Tech. 97, 158 (2020) (referring to "inventions without an inventor"); Schwartz & Rogers *supra* note 11 at 536; Ryan Abbott, *supra* note 26 at 1098; Jeffrey Wu, *Bridging the AI Inventorship Gap*, 91 Fordham L. Rev. 2515, 2532 (2023).

[22] *Second*, others argue that, under the doctrine of "first to recognize and appreciate," because "conception" is inherently a mental process done by humans, an invention is not conceived (and thus not invented) until a human recognizes and appreciates the invention. Thus, a person who recognizes and appreciates an invention generated by AI is entitled to be an inventor of the idea, even if the AI system, and not the human, originally "came up with" the invention in the colloquial sense. Under this view, a human would necessarily be an inventor on any otherwise patentable idea generated by an AI system, simply because a human would need to recognize and appreciate the invention in order to submit a proper patent application for it.

[23] *Third*, still others argue that the generation of an invention by an AI system is closely analogous to other circumstances in which an inventor makes and understands an invention at the same time – i. e., simultaneous conception and reduction to practice. This view recognizes that, in other areas of technology, some non-human process (such as an immune response in a mouse) can generate potential solutions to a problem, and human researchers have some role in sorting through and assessing whether the potential solutions work for the problem at issue. Under this approach, an AI-generated invention would be patentable, with a human as the inventor, but a human's mere recognition and appreciation of the invention may not suffice to make that human an inventor. Instead, the inventorship determination would be based on a person's particular contribution to the invention process.

[24] The sharp differences between these three views are largely driven by their disagreement about whether an inventor must *originally* conceive of an idea – colloquially, "come up with" the idea herself – or whether recognizing and appreciating an idea essentially *generated elsewhere* – namely, from an AI system – would suffice.[37] This area of law involves the closely related "derivation"[38] and "originality"[39] doctrines. Generally speaking, it is clear that a person cannot be an inventor if she derived the invention from another person; however, it is less clear whether deriving an invention from an AI system would run afoul of the originality requirement. Before the United States America Invents Act was passed, in 2011, a person would not be entitled to be an inventor if "he did not himself invent the subject matter sought to be patented."[40] The America Invents Act eliminated this statutory language, but it "did not eliminate the basic requirement of originality, that is, the requirement that the putative inventor not have derived an invention from another person."[41]

[25] Under the current statutory scheme, it is unclear whether the originality requirement only prohibits deriving an invention from another *person*, or whether it also prohibits deriving an invention from another source, such as an AI system. Arguably, the current derivation statutes only expressly prohibit derivation from another person;[42] thus, it may be argued that the current law should not prohibit deriving an invention from non-human sources, like an AI system.[43] It is well established that an inventor who does not intentionally design an invention, but instead stumbles upon it, is generally still entitled to inventorship.[44] Further, the Patent Act grants patents not only to one who "invents," but also to one who "discovers."[45] Thus, one who "discovers" an otherwise patentable invention, whether in nature or in the output of a technological tool, like an AI system, is arguably entitled to be an inventor.

[26] The debate about whether the originality requirement bars human inventorship for AI-generated inventions boils down to this: is a person who patents an AI-generated invention improperly taking the invention from another (like how a person might steal an invention from a competing human inventor), or is that person permissibly appreciating the output of her technological tool?

1. View 1: AI-led inventions are unpatentable if no human made a traditionally "significant contribution"

[27] According to some, under *Thaler*, an invention is entirely unpatentable if an AI system generated the invention and no human meaningfully contributed to

37 *Compare* Schwartz & Rogers, *supra* note 11 at 569 (describing theory by which an individual can become an inventor "by the grace of having noticed and therefore 'conceived' the useful output of an unpredictable process") *with* Joshua D. Sarnoff Comment In Response to USPTO Request for Comments Regarding Artificial Intelligence and Inventorship at 1 (May 15, 2023) ("[T]he PTO should not attribute the AI's inventive contribution (if any) to any other, human joint inventor, who would actually derive rather than originally invent the inventive contribution made by an AI when conceiving of the entire claimed invention.").

38 *See* Moy's Walker on Patents, *supra* note 19 at § 10:28 ("Described loosely, derivation refers to situations in which an invention is not original to the person who is under scrutiny. A person is thus said to have derived knowledge of the invention when he or she did not participate as an inventor, but instead merely received the knowledge from another. Derivation thus describes the conclusion that a person would be barred from obtaining patent rights by section 102(f).")

39 *See* 1A Chisum on Patents § 2.03 ("The originality requirement bars issuance of a patent to a person or persons who derive the conception of the invention from any other source or person.").

40 35 U. S. C. § 102(f) (2002) (prior to the enactment of the United States America Invents Act).

41 1 Chisum on Patents § 2.03; *Madstad Eng'g, Inc. v. U. S. Pat. & Trademark Off.*, 756 F.3d 1366, 1368 (Fed. Cir. 2014) ("Under the AIA … [t]he named inventor must have invented the invention independently and not derived the idea from another.").

42 *See* 35 U. S. C. § 135 (referring to derivation from "an individual"); 35 U. S. C. A. § 291 (referring to derivation from an "inventor").

43 An inventor must generally be an "original inventor" or "original joint inventor." *See* 35 U. S. C. § 115. However, note that a human who entirely took an idea from an AI system is arguably still an "original" – i. e., the first – "inventor," simply because an AI system is not a human and thus cannot be an inventor.

44 *See* Dan L. Burk, AI Patents and the Self-Assembling Machine, 105 Minn. L. Rev. Headnotes 301, 307 (2021) ("Invention that occurs by accident or happenstance, and could not have been foreseen before actual instantiation of the invention, still merits the reward of a patent.").

45 35 U. S. C. § 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 … .").

it.[46] For example, the applicant in *Thaler* listed an AI system as the sole inventor in the patent application, and he did not add himself as an inventor. As that applicant argued to the Supreme Court:

[28] "[T]o claim inventorship, [the human applicant] must attest that he at least 'contribute[d] in some significant manner to the conception … of the invention.'…; *see also* 35 U. S. C. § 115(b)(2) (inventor must "believe[] himself or herself to be the original inventor or an original joint inventor of a claimed invention in the application"). [The human applicant] cannot do that because he provided [the AI system] with only general information about the state of the art in multiple scientific fields."[47]

[29] The applicant thus appeared to rely on two explanations for why he properly did not list himself (or any other human) as an inventor: (1) the human applicant's contribution was not "significant" and (2) he was not the "original" inventor because the AI system came up with the idea first. However, under either approach, a human might properly be said to be an inventor of an AI-generated invention.

[30] Taking the two explanations in turn: First, the legal requirement that a joint inventor make a "significant contribution" to the conception of an invention is a flexible standard that depends on the context. Patent law has rejected the notion that a human must have a "flash of genius" for an invention to be patentable,[48] and the Patent Act recognizes that "[p]atentability shall not be negated by the manner in which the invention was made." 35 U.S.C § 103. These rules reflect a functional approach to patentability: it is generally the objective qualities of an invention, not the subjective process by which it was conceived, that matters. It should not matter whether an invention came about because of human brilliance, because someone stumbled upon it (like, as the legend goes, Penicillin), because someone decided to try to develop and test an inordinate number of possible solutions (like, as the legend goes, Edison's electric lightbulb filaments), or because an AI system suggested the solution. Patent law has long recognized as inventors certain individuals who came across an invention only after it was already made, where they then recognized and appreciated the invention.[49] Thus, a "significant contribution" to the conception of an invention need not take any particular form, and a court would likely be open to the possibility that at least some person associated with the relevant AI system made a contribution to the invention that should be considered "significant."

[31] Second, it may be argued that the originality requirement does not bar a human from being an inventor on an AI-generated invention because this requirement is aimed at prohibiting the derivation of inventions from other humans, not from other sources.[50] Inventors are generally permitted to draw on non-human outside sources in coming up with their inventions. For example, the inventor of Velcro was purportedly inspired by "thistle burrs that attached themselves to" his dog's fur.[51] This inspiration does not render the burrs the true inventor, nor does it constitute improper derivation from nature.[52]

[32] Further, many commentators argue that there are strong policy reasons for allowing the patenting of AI-generated inventions, including the typical patent goals of incentivizing invention and encouraging the full disclosure of new inventions to the public.[53] In light of these policy concerns, a court may decide not to render AI-generated inventions entirely unpatentable, especially in light of the flexible "significant contribution" standard that would apply to a potential human joint inventor.[54]

2. View 2: The first human to recognize and appreciate an AI-generated invention is an inventor

[33] Others have proposed a tidy rule to determine inventorship of AI-generated inventions: the first person to recognize and appreciate an AI-generated invention should be an inventor.[55] According to this approach, conception is fundamentally a mental act, and an AI system does not have a mind and thus cannot perform the mental act of conception. However, the first person to sufficiently recognize and appreciate an AI-generated invention has performed the mental act of conceiving the invention, and thus that

46 *See* Schwartz & Rogers, *supra* note 11 at 536 (2022) ("As things stand, AI-produced inventions appear to be, as a matter of law, unpatentable."); Dornis, *supra* note 36 at 103 (2020) ("Because these scenarios do not involve an immediate input of human ingenuity or creativity, under the law as it stands, no patentable invention exists."); Brief of Lawrence Lessig et al. as Amici Curiae Supporting Petitioner at 16, *Thaler*, 143 S. Ct. 1783 (No. 22-919) (stating that *Thaler* "nullifies patent protection for all AI-generated inventions by voiding the recognition of AI as an autonomous 'inventor.'"); Brief of The Chicago Patent Attorneys as Amici Curiae Supporting Petitioner at 12, *Thaler*, 143 S. Ct. 1783 (No. 22-919) ("If, as is true for this case, no human can be identified as the 'inventor' of machine-generated ideas and a machine cannot be an inventor under the Patent Act, then these ideas cannot receive patent protection.").

47 Petition for Writ of Certiorari at 29, *Thaler*, 143 S. Ct. 1783 (No. 22-919) (citation omitted).

48 *See, e. g., CFMT, Inc. v. Yieldup Int'l Corp.*, 349 F.3d 1333, 1340 (Fed. Cir. 2003) ("[P]atent acquisition does not require any threshold level of effort or ingenuity.").

49 *See* discussion *infra* Section IV.B; Burk, *supra* note 44 at 308 (2021) ("In instances where the inventor does not or cannot imagine the form of the invention in advance of actually having reduced the invention to practice, patent law has held that the invention is conceived when it is recognized by the inventor.").

50 *See supra* text accompanying note 38.

51 Burk, *supra* note 9 at 132.

52 Burk, *supra* note 9 at 132.

53 *See* Brief of Lawrence Lessig et al. as Amici Curiae Supporting Petitioner at 17, *Thaler*, 143 S. Ct. 1783 (No. 22-919) ("The denial of patent protection to AI inventions contradicts the goals of patent laws to promote technology development and innovation, to encourage disclosure of valuable inventions, and to support the commercialization of inventions.")

54 *See also supra* Section IV. C.

55 *See, e. g.,* Abbott, *supra* note 26 at 1098 (2016) ("[A] person can qualify as an inventor simply by being the first individual to recognize and appreciate an existing invention. That is to say, someone can discover rather than create an invention. Uncertainty (and accident) is often part of the inventive process. In such cases, an individual need only understand the importance of an invention to qualify as its inventor.").

person should be an inventor.[56] The doctrine of "first to recognize and appreciate" had previously been used to determine *when* an invention was conceived, to determine what counted as prior art or who invented a patented work first.[57]

[34] Applying this rule to establish inventorship for AI-generated inventions may be said to potentially lead to arbitrary and unfair results, largely because the first person to recognize and appreciate an AI-generated invention may otherwise have had little involvement in the development of the invention. For example, a number of people may have access to the output of an AI system, and the person who is first to recognize and appreciate given output as a useful invention may be more the product of happenstance and luck than of the person's particular involvement with the invention.[58] One law professor has raised several issues with this approach, such as arbitrariness, the risk for disputes about who recognized the invention first, the decoupling of the inventive work from the named inventor (potentially leading to misaligned incentives), and under-rewarding deserving technologists who contributed to the invention.[59]

3. View 3: Under the doctrine of simultaneous conception and reduction to practice, a human involved with the AI system would generally be entitled to be an inventor

[35] Between the extremes of denying patentability for a primarily AI-generated invention, and granting inventorship to the first person who appreciates such an invention, is the "simultaneous conception and reduction to practice" doctrine.[60] This doctrine recognizes that, in certain circumstances, conception is not complete until an invention has been fully made, i. e., reduced to practice, because the inventor does not have a complete mental picture of the invention until the inventor studies the completed invention. The doctrine may apply with technologies that utilize processes with uncertain, potentially unexpected outputs. In such circumstances, the inventor may not "design first and make later," as the typical invention story goes. Instead, the inventor may make the invention first—sometimes, by making many different iterations of a product all at once—and then study the results to see if any meet the desired criteria. If one such product does, the inventor may study it to determine its structure and how it works, in order to prepare a proper patent application for it. The doctrine has traditionally been used to determine the time of conception for certain inventions.[61]

[36] While some scholars treat the "simultaneous conception and reduction to practice" and the "first to recognize and appreciate" doctrines as the same for purposes of deciding inventorship of AI-generated inventions,[62] these doctrines are arguably distinct. The doctrine of simultaneous conception and reduction to practice awards inventorship based on traditional principles – namely, the significance of a person's contribution to the invention.[63] Conversely, the first to recognize and appreciate doctrine (at least arguably) mechanically awards inventorship to the first person to recognize and appreciate an AI-generated invention, perhaps as an imprecise workaround to ensure such inventions are always patentable.

[37] The simultaneous conception and reduction to practice doctrine offers no definitive rules to decide inventorship where an AI system and humans work together to develop an invention; instead, it offers a body of caselaw analogous to many AI-generated inventions. In both traditional simultaneous conception and reduction to practice cases, and in the case of many potential AI-generated inventions:

- humans typically design the applicable process or algorithm (often painstakingly);
- humans select and provide the material (or data) used in the process;
- the process can produce voluminous (sometimes low quality) output;
- humans must study the results of the process to verify whether the desired criteria were met; and
- in order to patent the potential invention, humans must study the results of the process to understand, appreciate, and characterize any potential invention well enough to satisfy the various requirements for a patent application, including the written description, enablement, and best mode requirements.

[38] In simultaneous conception and reduction to practice cases, the process or thing that literally generates the ultimate invention – sometimes, a mouse[64] –

56 *See* Rachel L. Schwein, Patentability and Inventorship of AI-Generated Inventions, 60 Washburn L. J. 561, 581 (2021).
57 *See id.* at 580 (doctrine "typically used to date conception for purposes of determining prior art"); Wu, *supra* note 36 at 2535 (doctrine initially used "to determine priority—i.e., who invented the invention first—in pre-AIA cases").
58 *See* Abbott, *supra* note 26 at 1104 ("One could imagine this creating a host of problems: the first person to recognize a patentable result might be an intern at a large research corporation or a visitor in someone's home. A large number of individuals might also concurrently recognize a result if access to an AI is widespread.").
59 Dornis, *supra* note 36 at 124.
60 *See* Burk, *supra* note 44 at 308 ("Serendipitous or unforeseen inventions qualify as inventions due to the doctrine of simultaneous conception and reduction to practice. In instances where the inventor does not or cannot imagine the form of the invention in advance of actually having reduced the invention to practice, patent law has held that the invention is conceived when it is recognized by the inventor.").
61 *See* Burk, *supra* note 44 at 308.
62 *See* Schwartz & Rogers, *supra* note 11 at 578.
63 *See* Rachel L. Schwein, *supra* note 56 at 597 (For simultaneous conception and reduction to practice: "Both conception and reduction to practice occur simultaneously and any person who contributed to reduction to practice also contributed to conception. Accordingly, any person who made 'a contribution to the claimed invention that is not insignificant in quality, when that contribution is measured against the dimension of the full invention,' is an inventor.").
64 *See* Atomwise Inc. et al. Comments In Response to USPTO Request for Comments Regarding Artificial Intelligence and Inventorship at 3-4 ("The use of AI in biologics drug discovery to identify potential new proteins of interest … is a computational alternative to injecting mice with particular antigens to allow the mice's immune systems to produce antibodies that bind with the injected antigens… . AI systems are not 'sharing in the conception of a claimed invention', much in the same way a mouse producing antibodies in response to an injected antigen has never been considered to share in the conception of a drug derived from the antibodies the mouse produced.").

is often not deemed the inventor. Instead, the humans who use the process as a tool to invent are generally deemed the inventors.

[39] Using the doctrine of simultaneous conception and reduction to practice to guide inventorship for AI-generated inventions has potential drawbacks. Some scholars raise that AI-generated inventions may be different from traditional simultaneous conception and reduction to practice cases because, given the potential capability of an advanced AI system to perform steps traditionally performed by humans, it may be "questionable whether any human conceived of the invention in a meaningful sense" in the case of an AI system.[65] Similarly, another scholar pointed out that this doctrine can falter for an AI system if no human made a "significant" contribution to the invention because the doctrine would still leave the invention without an inventor.[66] However, these worries seem unlikely to materialize, based on both the current state of technological advancements and the law. As a number of AI industry players have pointed out, in practice, humans are heavily involved in many aspects of AI systems, and even advanced AI systems do not allow one to push a button and get an invention.[67] Thus, humans will likely be involved in meaningful ways in any AI-generated invention, at least for the foreseeable future.

[40] Further, the legal requirement of a "significant contribution" is flexible and requires considering the context of the invention.[68] Given this flexibility, a court may view at least some human as having made a significant contribution, if only to avoid the unfair result that an invention would be deemed unpatentable simply because of the amorphous legal "significant contribution" standard.

[41] Drawing from the simultaneous conception and reduction to practice doctrine seems to provide a viable approach for determining inventorship for an invention that was primarily generated by an AI system. Entirely denying such inventions patent protection may be inappropriate because, as discussed above (1) this approach is based on an originality requirement that only clearly prohibits deriving inventions from people (not from machines); and (2) denying patent protection for this class of inventions may contravene policy goals of the Patent Act. Conversely, granting inventorship to the first person to recognize and appreciate an AI-generated invention may lead to arbitrary results and potentially high-stakes disputes about "who saw it first." The doctrine of simultaneous conception and reduction to practice may allow flexible consideration of the contribution of each human, as measured against the scope of the invention, to determine which humans should be granted inventorship status for an invention in which both humans and an AI system made contributions.

[42] Avoiding the potential downsides of this approach may require modest adjustments to the doctrine in response to the complex factual circumstances that will inevitably arise in litigating AI-related inventorship issues. For example, a court may confront circumstances where an AI system took all the steps that would ordinarily be considered "significant" in generating and characterizing the significance of an invention. In this case, a court may interpret the flexible term "significant contribution" to mean the "most significant contribution by a potential inventor." That is, even if no human contributed what would traditionally be considered a "significant" amount to the conception of the invention, some human surely contributed more than any other human by, for example, taking the output of the AI system and adapting it to meet the requirements of a patent application.

IV. Disclosures made with an AI collaborator may render an invention unpatentable

[43] Whether AI systems can "invent" is a difficult question. Whether they can generate prior art is a relatively easy question: they likely can.[69] For example, generative AI systems can create publications that did not exist before, and current patent law does not inquire into the mind of an author of a prior art publication.[70] AI systems can thus both generate prior art and contribute to an invention, but they cannot be an inventor. This creates a risk of unpatentability in certain circumstances when humans work with AI systems to develop an invention.

[44] Human inventors are often eager to publicize their inventions as soon as possible. Academic inventors often need to publish about their inventions,

65 Schwartz & Rogers, *supra* note 11 at 570.
66 *See* Schwein, *supra* note 56 at 600.
67 *See* Microsoft Comments In Response to USPTO Request for Comments Regarding Artificial Intelligence and Inventorship at 3 (Docket No. PTO-P-2022-0045) (May 15, 2023) ("Like previous AI models, LLM development occurs in four stages: selection or design of model structure, training of a model, deployment of the trained model into an execution environment, and application design. Human input is necessary for all four stages."); *id.* at 9 ("[I]t is Microsoft's experience that all inventions require human input, even if AI aids the inventor. Thus, there is no need to revise the law to have non-humans be inventors because a human inventor can apply for a patent.").
68 *See Fina Oil & Chem. Co. v. Ewen*, 123 F.3d 1466, 1473 (Fed. Cir. 1997) (To be a joint inventor, "an individual must make a contribution to the conception of the claimed invention that is not insignificant in quality, when that contribution is measured against the dimension of the full invention").
69 The repercussions of AI-generated prior art are the subject of great interest and debate. *See, e.g.,* Matthew Horton, Alexandra L. Lodge, Foley & Lardner LLP, *Notable themes in public comments submitted to the USPTO related to AI patent policy*, 38 No. 17 Westlaw J. Comput. & Internet 04 (last accessed Nov. 19, 2023) ("Another potential issue is that AI could be used to generate and proliferate 'a never before seen volume' of prior art. An AI could be configured to stitch together various related concepts to automatically generate and publish prior art… . The potential effect of AI on the universe of prior art remains an ongoing debate, mostly rooted in speculative problems.").
70 *Cf. Schering Corp. v. Geneva Pharms., Inc.*, 339 F.3d 1373, 1380 (2003) ("A reference may enable one of skill in the art to make and use a compound even if the author or inventor did not actually make or reduce to practice that subject matter."); *Bose Corp. v. JBL, Inc.*, 112 F. Supp. 2d 138, 154 (D. Mass. 2000), *aff'd*, 274 F.3d 1354 (Fed. Cir. 2001) ("Under § 102(b), a printed publication qualifies as prior art, regardless of its origin.").

and inventors in industry (or their employers) often need to publicly market their inventions to recoup invention costs and make a profit. The Patent Act has historically struck a balance between allowing inventors to publicize their inventions early and the policy goal of having inventors promptly file patent applications. The Patent Act generally provides inventors a one-year "grace period"[71] to file a patent application after publicly disclosing an invention. For example, under 35 U.S.C. § 102(b)(1)(A), such a pre-application disclosure is not prior art if "the disclosure was made by the inventor or joint inventor or by another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor."

[45] Today, large, highly collaborative teams often work with an AI system to develop inventions. During development efforts, multiple researchers may work with a particular AI system to seek to solve a certain problem, and it may be unclear which of the researchers should be named as a joint inventor on an eventual patent application. Given the pressures to publicize research results early, the team may regularly release results during the development efforts.

[46] This can create a risk of unpatentability. Before *Thaler*, if a key contributor in the invention effort is bound to be on both any publication and on any eventual patent application, the grace period statue would allow that contributor to publish (potentially with others) and then have a year to file a patent application (potentially with others). Now, if such a key contributor is an AI system, the grace period statue does not apply (because the AI system cannot be a joint inventor), and the publication may be said to block the patentability of the invention.

[47] For example, a team of researchers may work with an AI system to create an invention, and one such researcher may publish initial results with the AI system. In preparing a later patent application, the researchers may assess the murky standards for joint inventorship and determine that only two other researchers made "significant contributions" to the invention, and thus they should be deemed the only joint inventors. If those two researchers submit a patent application, there is a risk that they would not be entitled to the statutory one-year grace period and thus the invention would not be patentable because it would not be novel in light of the publication, even though the invention was the joint result of the collaboration of the three researchers with the AI system.

[48] One way to address this risk is for researchers to closely police publications made before a patent application has been filed, and to make sure team members do not publish results with an AI system until inventorship questions are decided. However, this approach could undermine the balance struck by the Patent Act between prompt disclosure of research and the desire for timely patent applications. Researchers may simply wait until a patent application is filed before publishing any results to reduce risk, largely eliminating the benefit the one-year grace period is meant to have for early disclosure of research results.

[49] Amendment of the relevant statute could also address this risk. For example, 35 U.S.C. § 102(b)(1)(A) could be amended to reflect that the one-year grace period applies to disclosures made by any significant contributors to an invention (whether human or technological), not just to joint inventors. Of course, any revision to statutory language should be carefully considered to avoid unintended consequences.

V. Conclusion

[50] The *Thaler* court ruled that an AI system cannot be an inventor; however, it did not address the common situation in which humans and an AI system work together to develop an invention. The repercussions of the *Thaler* decision in such circumstances are unclear.

[51] This article considered three particular areas in which *Thaler* left open questions about joint inventorship for AI-generated inventions: (1) whether contributions of an AI system should be compared to the contributions of a human in determining inventorship by the human; (2) whether an AI-generated invention in which humans played a relatively minor role in conception is patentable; and (3) whether AI systems can create prior art that would block patentability of a related invention, even if humans were involved in both the prior art and in the invention.

[52] While these are difficult questions, two consistent themes suggest that patent doctrine can successfully adapt to the new regime in which AI systems can contribute to an invention but cannot be an inventor. First, *Thaler*'s holding was narrow: it only held that an AI system cannot be an inventor because it is not a human. Thus, the decision left open the possibility that AI systems and humans can work together to make *contributions* to an invention in a variety of ways. Second, the "significant contribution" standard for joint inventorship is quite flexible; thus, it may allow patent law to adapt to a world in which humans contribute to inventions in new ways given the advanced AI systems now at their disposal.

71 *See* Robert P. Merges, Priority and Novelty Under the AIA, 27 Berkeley Tech. L.J. 1023, 1030-31 (2012) ("Under AIA § 102(b)(1)(A), an inventor has to file a patent application within one year from the time he or she discloses an invention.").