BRIDGING THE AI INVENTORSHIP GAP

*Jeffrey Wu**

In Thaler v. Vidal, *the U.S. Court of Appeals for the Federal Circuit ruled that an artificial intelligence (AI) machine cannot be an inventor under patent law. This decision leaves open the question of whether a natural person can be the legal inventor of AI-generated inventions. This is a pressing question because it decides whether AI-generated inventions are patentable, as no patent rights can exist without an inventor.*

Scholars have proposed two doctrines that might resolve this question: (1) the doctrine of simultaneous conception and reduction to practice and (2) the doctrine of first to recognize and appreciate. This Note analyzes the two doctrines and argues that neither doctrine readily applies to AI-generated inventions, thereby leaving an "inventorship gap."

Because the current patent system is ill-equipped to deal with the inventorship of AI-generated inventions, Congress should adopt and repurpose copyright law's work-for-hire doctrine and recognize the natural person using the invention-generating AI as the legal inventor of those inventions. Doing so bridges the inventorship gap, offers certainty as to the patentability of AI-generated inventions, and facilitates the goals of the patent system.

* J.D. Candidate, 2024, Fordham University School of Law; M.S., 2019, National Chengchi University; B.S., 2017, National Tsing Hua University. Thank you to Professor Aditi Bagchi for her knowledge and guidance throughout the process. I would also like to thank Kevin Green and the other members of the *Fordham Law Review* for their feedback and editing. Finally, I would like to thank P.H. and my family and friends for their unconditional love and support.

INTRODUCTION

You are very excited because your artificial intelligence (AI) machine just notified you that it generated a new idea. It exported an original toothbrush design with crossing bristles. You are surprised at how ingenious this design is, as you had never thought of arranging the bristles of a toothbrush into a crossing pattern. Nor did you explicitly instruct the AI machine to design a new toothbrush. Rather, you only provided the AI machine with information about existing oral hygiene product designs and how well they perform. You recognize the commercial value of this new toothbrush and decide to apply for a patent for this new invention. You discuss the idea with your patent attorney, and after a preliminary patent search, it appears that no one has ever contemplated this design.[1] You explain the value of the new design with confidence when your patent attorney asks you how it is better than a traditional toothbrush. But when they ask how you came up with the idea, you pause. You reply: "Well . . . my AI machine generated the design. So, technically, I didn't come up with the idea, but it doesn't matter who really came up with the idea, right? I can still patent it?"

1. One of the patentability requirements is the novelty of the invention. *See infra* notes 37–42 and accompanying text.

It turns out, it does matter. Patent rights vest only in the inventor.[2] Without an inventor, these rights do not exist, and there can be no patent.[3] Indeed, naming an incorrect inventor is grounds for patent invalidation.[4] Therefore, it is critical to identify the correct inventor. So, the question is: who is the inventor of the new toothbrush pattern?

AI has already demonstrated its power to revolutionize industries.[5] It is already capable of generating original content such as music,[6] art,[7] and even fake news.[8] With OpenAI's showcase of ChatGPT[9] and Google's launch of Bard,[10] generative AI is now more widespread than ever. It may not be long before anyone with an internet connection can order an AI machine to create an invention—just like anyone with access to DALL-E can order it to create art, despite not being a skilled artist themselves.[11] However, under current patent law, AI machines cannot be inventors because they are not natural persons.[12] Therefore, the AI that created the cross-bristled toothbrush cannot be its legal inventor. Does the AI-generated invention then simply enter the public domain, or is there a legal inventor under current patent jurisprudence? Specifically, can the person using the AI be the legal inventor when they did not come up with the idea?

---

2. U.S. CONST. art. I, § 8, cl. 8; 35 U.S.C. § 101; Beech Aircraft Corp. v. EDO Corp., 990 F.2d 1237, 1248 (Fed. Cir. 1993); *see infra* notes 53–55 and accompanying text.

3. *See* Gemstar-TV Guide Int'l, Inc. v. Int'l Trade Comm'n, 383 F.3d 1352, 1381 (Fed. Cir. 2004) ("A patent is invalid if more or fewer than the true inventors are named." (citing Jamesbury Corp. v. United States, 518 F.2d 1384, 1395 (Ct. Cl. 1975))).

4. *See id.*

5. *See generally* Rob Thomas, *How AI Is Driving the New Industrial Revolution*, FORBES (Mar. 4, 2020, 4:51 PM), https://www.forbes.com/sites/ibm/2020/03/04/how-ai-is-driving-the-new-industrial-revolution/ [https://perma.cc/P6DP-G8FX].

6. *See, e.g.*, Alex Marshall, *From Jingles to Pop Hits, A.I. Is Music to Some Ears*, N.Y. TIMES (Jan. 22, 2017), https://www.nytimes.com/2017/01/22/arts/music/jukedeck-artificial-intelligence-songwriting.html [https://perma.cc/XQB5-P89X].

7. *See, e.g.*, Cade Metz, *Meet DALL-E, the A.I. That Draws Anything at Your Command*, N.Y. TIMES (Apr. 6, 2022), https://www.nytimes.com/2022/04/06/technology/openai-images-dall-e.html [https://perma.cc/XQX9-S2ZC].

8. *See, e.g.*, Drew Harwell, *Top AI Researchers Race to Detect "Deepfake" Videos: "We Are Outgunned,"* WASH. POST (June 12, 2019, 4:44 PM), https://www.washingtonpost.com/technology/2019/06/12/top-ai-researchers-race-detect-deepfake-videos-we-are-outgunned/ [https://perma.cc/Y2LE-K2X4].

9. ChatGPT is a language model that generates human-like responses to text inputs. *See Introducing ChatGPT*, OPENAI, https://openai.com/blog/chatgpt/ [https://perma.cc/87AK-4PZQ] (last visited Apr. 3, 2023). The amazing part of ChatGPT is its ability to generate any kind of text, including guitar tabs or computer code. Will Douglas Heaven, *OpenAI's New Language Generator GPT-3 Is Shockingly Good—and Completely Mindless*, MIT TECH. REV. (July 20, 2020), https://www.technologyreview.com/2020/07/20/1005454/openai-machine-learning-language-generator-gpt-3-nlp/ [https://perma.cc/RXF3-ZDY7].

10. Similar to ChatGPT, Bard is an AI-powered chatbot by Google that is capable of generating detailed responses from text prompts. *See* Zoe Kleinman, *Bard: Google Launches ChatGPT Rival*, BBC (Feb. 6, 2023), https://www.bbc.com/news/technology-64546299 [https://perma.cc/LJ4B-62WU].

11. *See DALL-E 2*, OPENAI, https://openai.com/dall-e-2/ [https://perma.cc/5HSL-L9TL] (last visited Apr. 3, 2023).

12. *See* Thaler v. Vidal, 43 F.4th 1207, 1213 (Fed. Cir. 2022), *petition for cert. filed*, No. 22-919 (U.S. Mar. 21, 2023).

This Note explores whether a natural person can be the legal inventor of AI-generated inventions. It argues that the current patent system is ill-equipped to deal with AI-generated inventions. To bridge this gap, Congress should repurpose copyright law's work-for-hire doctrine and recognize the person using the invention-generating AI machine as the legal inventor of those AI-generated inventions. Part I introduces the patent system and the basics of legal inventorship. It also covers how AI-generated inventions are created and addresses questions that they raise. Part II discusses two patent doctrines that scholars have proposed to resolve the question of whether a natural person can be the legal inventor of an AI-generated invention: (1) the doctrine of simultaneous conception and reduction to practice and (2) the doctrine of first to recognize and appreciate. Lastly, Part III argues that neither patent doctrine applies to AI-generated inventions, thus leaving an "inventorship gap." To bridge this gap, Congress should repurpose the work-for-hire doctrine and carve out an inventor definition for AI-generated inventions. This new approach should require that the person using the AI machine to generate inventions be credited as the inventor. Doing so would not only offer certainty as to the patentability of AI-generated inventions, but also facilitate the goals of the patent system.

I. PATENTS, INVENTORSHIP, AND AI-GENERATED INVENTIONS

This Note begins by introducing the basics of the patent system and AI-generated inventions. Part I.A introduces the patent system, its justifications, and the requirements for obtaining a patent. Part I.B discusses the basics of inventorship, including its importance, how it is determined, and how it compares with authorship. Part I.C explains how AI machines generate inventions and addresses the inventorship questions that they raise.

A. Background on Patents

A patent is the grant of a property right in an invention.[13] It provides the patent owner the right to "exclude others from making, using, offering for sale, or selling the invention throughout the United States or importing the invention into the United States"[14] for twenty years.[15] A patent, however, does not grant the right to practice the invention.[16] It only allows the patent owner to exclude others from practicing the invention by suing patent infringers.[17] But what justifies this monopoly?

13. *General Information Concerning Patents*, U.S. PAT. & TRADEMARK OFF., https://www.uspto.gov/patents/basics/general-information-patents [https://perma.cc/WRW7-ABGS] (Mar. 27, 2023, 5:22 PM).

14. 35 U.S.C. § 154(a)(1).

15. The default term of a patent is twenty years. *Id.* § 154(a)(2). *But see, e.g.*, *id.* § 154(b) (enumerating patent term adjustments); *id.* § 156 (authorizing patent term extensions under certain circumstances).

16. *General Information Concerning Patents*, *supra* note 13.

17. 35 U.S.C. §§ 154(a)(1), 271(a).

1. Justifications for the Patent System

The prevailing justification for the patent system is outlined in the U.S. Constitution.[18] To "promote the Progress of Science and useful Arts," the Intellectual Property Clause gives Congress the power to grant inventors exclusive rights to their inventions.[19] The monopoly that patents offer encourages inventors to invest in creative efforts with the expectation that they can foreclose competition for a certain period of time.[20] Without the expectation of a return on investment, inventors would be less incentivized to invent because creating new technology is expensive[21] and risky.[22] Once the patent expires, the public can practice the invention, thereby improving society's welfare.[23]

Another justification for the patent system is to reward the inventor for their labor.[24] This is known as the labor theory of patent law.[25] This theory is often traced back to John Locke's property theory, which argues that people enjoy a natural right to property that is justified by the expenditure of their labor.[26] In the context of patent law, inventors receive the right to exclude others from practicing their inventions as a reward for their mental labor.[27] However, to enjoy the monopoly that patent rights offer, inventors must meet certain substantive and administrative requirements.[28]

2. Requirements for Obtaining a Patent

To obtain a patent, the applicant must file a patent application with the U.S. Patent and Trademark Office (USPTO).[29] The USPTO then issues the patent if the application meets the statutory requirements outlined in 35 U.S.C. §§ 101–103 and § 111.[30]

Section 101 imposes four requirements.[31] First, it requires whoever invents or discovers an eligible invention to obtain only one patent for that

---

18. *See* U.S. CONST. art. I, § 8, cl. 8; *see also* Graham v. John Deere Co., 383 U.S. 1, 9 (1966) ("[The monopoly] was a reward, an inducement, to bring forth new knowledge.").

19. U.S. CONST. art. I, § 8, cl. 8.

20. Biotechnology Indus. Org. v. District of Columbia, 496 F.3d 1362, 1372 (Fed. Cir. 2007).

21. 1 JOHN W. SCHLICHER, PATENT LAW, LEGAL AND ECONOMIC PRINCIPLES § 2:4 (2d ed. 2015).

22. *Id.* § 2:5.

23. 1 R. CARL MOY, MOY'S WALKER ON PATENTS § 1:30 (4th ed. 2020).

24. *See* Adam Mossoff, *Who Cares What Thomas Jefferson Thought About Patents?: Reevaluating the Patent "Privilege" in Historical Context*, 92 CORNELL L. REV. 953, 982–83 (2007) (arguing that patent rights are civil rights and that the natural rights principle that one should reap the fruit of their mental labor is applicable to patent rights).

25. *Id.*

26. *See* Joan E. Schaffner, *Patent Preemption Unlocked*, 1995 WIS. L. REV. 1081, 1089–90, 1099–100.

27. 1 MOY, *supra* note 23, § 1:29; Schaffner, *supra* note 26, at 1089–92.

28. *See infra* note 30 and accompanying text; *infra* Part I.A.2.

29. *General Information Concerning Patents*, *supra* note 13.

30. Section 111 outlines the contents of a patent application and references 35 U.S.C. §§ 112–113 and § 115 for specific requirements. *See* 35 U.S.C. § 111.

31. MPEP § 2104 (9th ed. Rev. 10.2019, June 2020).

invention.[32] Second, the inventor, or each joint inventor, must be named in the patent application.[33] Third, the claimed invention must (1) fall within one of the four statutory categories set forth in § 101—i.e., process, machine, manufacture, or composition of matter[34]—and (2) not be an abstract idea, a law of nature, or a natural phenomenon.[35] Fourth, the claimed invention must be useful or have a utility that is specific and credible.[36]

Section 102 spells out the novelty requirement.[37] A claimed invention is not novel if it "was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention."[38] However, before the passage of the Leahy-Smith America Invents Act[39] (AIA) in 2011, an inventor could not obtain a patent for an invention if another person made the invention first, regardless of whether the other person applied for a patent for the invention or disclosed the invention to the public.[40] That is, only the first person to make an eligible invention was entitled to a patent pre-AIA.[41] Now, under the AIA, the first inventor to file a patent will not be barred from obtaining a patent if another person made the invention first, as long as the other person did not file a patent for the invention or disclose it to the public.[42]

Section 103 requires the claimed invention to be nonobvious to a person of ordinary skill in the art (POSA) at the time that the patent application is filed.[43] A POSA is a hypothetical legal construct "akin to the 'reasonable person' used as a reference in negligence determinations" under tort law.[44] They are presumed to know all the relevant art at the time of the invention.[45]

Lastly, § 111 outlines the required contents of a patent application.[46] The application must include a specification of the invention, a drawing of the

32. *Id.* §§ 804, 2104.
33. *Id.* §§ 2104, 2109.
34. 35 U.S.C. § 101.
35. MPEP §§ 2104, 2106; *see also* Alice Corp. v. CLS Bank Int'l, 573 U.S. 208, 216 (2014); Bilski v. Kappos, 561 U.S. 593, 601 (2010).
36. MPEP §§ 2104, 2107. For example, the claimed invention cannot be a perpetual motion machine because such machine is inoperable in practice. *See id.*
37. *See* 35 U.S.C. § 102.
38. *Id.*
39. Pub. L. No. 112-29, 125 Stat. 284 (2011) (codified as amended in scattered sections of the U.S.C.).
40. MPEP § 2120; 35 U.S.C. § 102(g) (1999).
41. *See* MPEP § 2120.
42. *Id.* The AIA has shifted the original first-to-invent system into a first-inventor-to-file system. CHRISTOPHER M. TUROSKI, AMERICA INVENTS ACT—A GUIDE TO PATENT LITIGATION AND PATENT PROCEDURE § 2:14 (2022). To obtain a patent, one must be the first inventor to file a patent for their eligible invention. *Id.* However, the AIA's passage does not mean that one can obtain a patent by first filing a patent for a stolen invention. *Id.* (illustrating an example in which "B," an industrial espionage agent who steals an invention from "A," is subject to inventorship misrepresentation if B names themselves as the inventor of A's invention); *see also* 35 U.S.C. § 101 ("*Whoever invents* . . . may obtain a patent therefor . . . ." (emphasis added)).
43. 35 U.S.C. § 103.
44. *In re* Rouffet, 149 F.3d 1350, 1357 (Fed. Cir. 1998).
45. MPEP § 2141.
46. *See* 35 U.S.C. § 111.

invention where necessary to explain the invention, and an oath or declaration from the inventor.[47] The specification and the drawing must describe the invention well enough to demonstrate that the inventor actually invented the claimed invention and to enable a POSA to make, use, and understand the claimed invention.[48] The oath or declaration must state that the patent application was authorized by the inventor and that the inventor believes that they are the original inventor of the claimed invention.[49]

B. Basics of Inventorship

Having covered background information on patents, this Note turns to introduce the basics of inventorship. In addition to exploring the importance of inventorship and how inventorship is determined, this section also provides a brief comparison of inventorship and copyright authorship.[50] It places a particular emphasis on copyright law's work-for-hire doctrine. This comparison is helpful because works made for hire are analogous to AI-generated inventions in many ways.[51] Therefore, the way in which copyright law approaches authorship under the work-for-hire doctrine may serve as a reference for patent law in assigning inventorship for AI-generated inventions.[52]

1. Importance of Inventorship

Inventorship is crucial to a patent.[53] Patent rights vest only in the inventor, and therefore, there can be no patent without an inventor.[54] Indeed, naming the wrong inventor is grounds for patent invalidation, as the patent rights

47. *Id.* §§ 111, 113.
48. MPEP §§ 2161–2164; *see also* 35 U.S.C. §§ 112–113.
49. 35 U.S.C. § 115.
50. Stemming from the Intellectual Property Clause of the Constitution, both patent law and copyright law are often compared hand in hand. *See* U.S. CONST. art. I, § 8, cl. 8; *see, e.g.*, Joshua L. Simmons, *Inventions Made for Hire*, 2 N.Y.U. J. INTELL. PROP. & ENT. L. 1, 49–50 (2012) (arguing that patent law should adopt an "inventions made for hire doctrine" that parallels to the work-for-hire doctrine under copyright law); 3 MOY, *supra* note 23, §§ 10:16–10:17 (comparing inventorship and authorship and criticizing patent law for failing to adopt a doctrine similar to copyright law's work-for-hire doctrine).
51. *See infra* notes 108–09 and accompanying text.
52. *See infra* Part III.B.
53. *See* 35 U.S.C. § 111(a) (requiring the inventor's authorization to apply for a patent).
54. *See* U.S. CONST. art. I, § 8, cl. 8; 35 U.S.C. § 101; Beech Aircraft Corp. v. EDO Corp., 990 F.2d 1237, 1248 (Fed. Cir. 1993) ("[T]he patent right initially vests in the inventor who may then, barring any restrictions to the contrary, transfer that right to another . . . ."); MPEP § 2157 (9th ed. Rev. 10.2019, June 2020) ("Although the AIA eliminated pre-AIA 35 U.S.C. 102(f), the patent laws still require the naming of the actual inventor or joint inventors of the claimed subject matter.").

would never have existed in the first place.[55] Hence, it is critical that any conveyance of patent rights traces back to the true inventor.[56]

Courts have rigidly applied the requirement that patent rights vest in the inventor.[57] Inventorship cannot be set aside or conceded.[58] Whether a person is qualified as an inventor is not affected by age,[59] capacity,[60] or marital status.[61]

Inventorship is not only of legal significance. Patents can also serve as credentials.[62] For example, employers consider being an inventor as a mark of success in certain fields.[63] Therefore, inventorship is also critical to the functioning of the job market.[64]

2. Determining Inventorship

So, what makes one an inventor? The Constitution mentions the word "inventor"; however, it does not offer any definitions.[65] The statutory definition of inventor offers no clarifications either, as it merely defines an inventor as the person(s) who "invented or discovered" the invention.[66] Fortunately, case law offers a more detailed explanation.[67] To qualify as an

---

55. Gemstar-TV Guide Int'l, Inc. v. Int'l Trade Comm'n, 383 F.3d 1352, 1381 (Fed. Cir. 2004) (citing Jamesbury Corp. v. United States, 518 F.2d 1384, 1395 (Ct. Cl. 1975)); *see also* Agawam Woolen Co. v. Jordan, 74 U.S. (7 Wall.) 583, 602 (1869) ("No one is entitled to a patent for that which he did not invent unless he can show a legal title to the same from the inventor or by operation of law . . . ."). However, incorrect inventorship alone does not render a patent invalid or unenforceable if there is no deceptive intent. *See* 35 U.S.C. § 256(b); Stark v. Advanced Magnetics, Inc., 119 F.3d 1551, 1555–56 (Fed. Cir. 1997) ("[A] patent may be unenforceable for inequitable conduct when any co-inventors are omitted with deceptive intent." (citing Burroughs Wellcome Co. v. Barr Lab'ys, Inc., 40 F.3d 1223, 1227 (Fed. Cir. 1994))); Viskase Corp. v. Am. Nat'l Can Co., 261 F.3d 1316, 1329 (Fed. Cir. 2001) ("Absent fraud or deceptive intent, the correction of inventorship does not affect the validity or enforceability of the patent for the period before the correction.").

56. 3 MOY, *supra* note 23, § 10:7. However, inventorship is presumed to be correct as patents are presumed to be valid. 35 U.S.C. § 282(a); *Gemstar-TV Guide Int'l, Inc.*, 383 F.3d at 1381 (citing Hess v. Advanced Cardiovascular Sys., Inc., 106 F.3d 976, 980 (Fed. Cir. 1997)).

57. 3 MOY, *supra* note 23, § 10:7 ("For example, it has been stated that the law's preference for the inventor cannot be set aside even by the inventor himself.").

58. *See, e.g.*, Koehring Co. v. E.D. Etnyre & Co., 254 F. Supp. 334, 359 (N.D. Ill. 1966).

59. *See, e.g.*, Fetter v. Newhall, 17 F. 841, 843 (C.C.S.D.N.Y. 1883).

60. *See, e.g.*, Jenner v. Bowen, 139 F. 556, 563 (6th Cir. 1905).

61. *Fetter*, 17 F. at 843.

62. *See* Jason Rantanen & Sarah E. Jack, *Patents as Credentials*, 76 WASH. & LEE L. REV. 311, 317 (2019).

63. *See, e.g.*, Chou v. Univ. of Chi., 254 F.3d 1347, 1359 (Fed. Cir. 2001) ("[B]eing considered an inventor of important subject matter is a mark of success in one's field, comparable to being an author of an important scientific paper.").

64. *See* Claire Wan-Chiung Cheng & Jeffrey Wu, *Taking a Slice of the Pie: An Empirical and Theoretical Inquiry on Allegedly Challengeable Inventorship*, 61 IDEA 184, 217–21 (2020) (arguing that inventorship misrepresentation is detrimental to the job market).

65. *See* U.S. CONST. art. I, § 8, cl. 8.

66. 35 U.S.C. § 100(f).

67. Even though the AIA has shifted the U.S. patent system to a first-inventor-to-file system, one must still conceive the invention to obtain a patent. *See* TUROSKI, *supra* note 42.

inventor, one must (1) conceive the invention ("Conception Requirement") and (2) be a natural person ("Natural Person Requirement").[68]

At its core, determining inventorship "is nothing more than determining who conceived the subject matter at issue."[69] Courts have reiterated the importance of conception in inventorship[70] and have defined it as "the completion of the mental part of the invention."[71] To complete the mental part of the invention, there must be a definite and permanent idea of an operative invention in the inventor's mind.[72] Therefore, merely posing a problem that needs to be solved, without offering specific instructions, is generally insufficient to constitute conception.[73] Moreover, there is no conception without the appreciation of the invention.[74] Thus, if person "A" accidentally creates an invention without appreciating its inventive nature, they are not the inventor because they did not recognize the invention and thus did not complete conception.[75] If person "B" later creates the same invention but appreciates it, they would be the legal inventor and would not be barred by person A's unappreciated creation of the invention.[76]

Once there is conception, the invention is deemed complete.[77] Thus, the act of transforming a completed conception into a workable and physical form—i.e., reduction of practice—is irrelevant in inventorship determinations.[78] Therefore, one is not an inventor if they simply perform

---

Therefore, pre-AIA case law regarding conception remains highly relevant under the AIA. 3A DONALD S. CHISUM, CHISUM ON PATENTS § 10.04 (2022).

68. *See* Univ. of Utah v. Max-Planck-Gesellschaft zur Forderung der Wissenschaften E.V., 734 F.3d 1315, 1323 (Fed. Cir. 2013).

69. Sewall v. Walters, 21 F.3d 411, 415 (Fed. Cir. 1994).

70. Burroughs Wellcome Co. v. Barr Lab'ys, Inc., 40 F.3d 1223, 1227–28 (Fed. Cir. 1994).

71. *Id.* at 1227–28 (citing Sewall v. Walters, 21 F.3d 411, 415 (Fed. Cir. 1994)); *see also id.* at 1228 (conception is completed when "the idea is so clearly defined in the inventor's mind that only ordinary skill would be necessary to reduce the invention to practice").

72. Hybritech, Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1376 (Fed. Cir. 1986). The mental act was tenuously associated with the "flash of genius" doctrine, which was formalized by the U.S. Supreme Court in 1941. Cuno Eng'g Corp. v. Automatic Devices Corp., 314 U.S. 84, 91 (1941). Under the flash of genius doctrine, a patentable invention "must reveal the flash of creative genius not merely the skill of the calling." *Id.* The doctrine was ultimately proven to be too vague to be workable and was superseded by statute. Graham v. John Deere Co., 383 U.S. 1, 15 (1966).

73. *See* Singh v. Brake, 317 F.3d 1334, 1341 (Fed. Cir. 2003).

74. Breen v. Henshaw, 472 F.2d 1398, 1401 (C.C.P.A. 1973); Heard v. Burton, 333 F.2d 239, 243 (C.C.P.A. 1964).

75. *See* Silvestri v. Grant, 496 F.2d 593, 597 (C.C.P.A. 1974) ("[A]n accidental and unappreciated duplication of an invention does not defeat the patent right of one who, though later in time, was the first to recognize that which constitutes the inventive subject matter.").

76. *See id.*

77. Mergenthaler v. Scudder, 11 App. D.C. 264, 276 (D.C. Cir. 1897).

78. MPEP § 2109 (9th ed. Rev. 10.2019, June 2020) ("Insofar as defining an inventor is concerned, reduction to practice, *per se*, is irrelevant."); *see also In re* DeBaun, 687 F.2d 459, 463 (C.C.P.A. 1982) ("[T]here is no requirement that the inventor be the one to reduce the invention to practice . . . ."). Reduction to practice can also be completed by filing a patent. MPEP § 2109.

routine tasks or follow detailed instructions from another.[79] The conception determination aligns with the patent system's goal of advancing the progress of science and the arts by awarding patent rights to original innovators and not those who merely construct the claimed inventions by applying routine skills of the art.[80]

Turning to the second element, the Natural Person Requirement mandates that the inventor be a human being as opposed to a juridical person.[81] In *Beech Aircraft Corp. v. EDO Corp.*,[82] the U.S. Court of Appeals for the Federal Circuit limited its reading of "individuals" in the statutory definition of "inventor" to mean natural persons.[83] It held that corporations cannot be inventors because they are not natural persons.[84] Other courts have incorporated the Conception Requirement into their reasoning to conclude that an inventor must be a natural person.[85] They reason that since conception is required for inventorship, and only a natural person is capable of conception, it follows that only a natural person can be an inventor.[86]

3. Contrast with Copyright Authorship and the Work-For-Hire Doctrine

This section provides a brief comparison of inventorship and copyright authorship, with an emphasis on copyright law's work-for-hire doctrine. This comparison is helpful because the way that copyright law approaches authorship may serve as a reference for patent law in assigning inventorship for AI-generated inventions.[87]

Like the patent system, the copyright system also draws its power from the Intellectual Property Clause of the Constitution.[88] Thus, similarly to patent law, in which title vests in the inventor,[89] copyright title vests initially in the author of the work.[90] Generally, the author is the one who "actually creates the work"[91]—that is, the person who translates the idea into a "fixed, tangible

79. Mattor v. Coolegem, 530 F.2d 1391, 1395 (C.C.P.A. 1976) (finding that a person who follows the oral instructions of another is viewed as merely a technician and not an inventor).

80. Applegate v. Scherer, 332 F.2d 571, 573 (C.C.P.A. 1964).

81. *See* Beech Aircraft Corp. v. EDO Corp., 990 F.2d 1237, 1248 (Fed. Cir. 1993) (stating that a corporation cannot be an inventor because an inventor must be a natural person).

82. 990 F.2d 1237 (Fed. Cir. 1993).

83. *Beech Aircraft Corp.*, 990 F.2d at 1248 (interpreting 35 U.S.C. §§ 115–118 to limit inventorship to natural persons).

84. *Id.*

85. *See, e.g.*, Univ. of Utah v. Max-Planck-Gesellschaft zur Forderung der Wissenschaften E.V., 734 F.3d 1323 (Fed. Cir. 2013); MBO Lab'ys, Inc. v. Becton, Dickinson & Co., 602 F.3d 1306, 1309 n.1 (Fed. Cir. 2010).

86. *Univ. of Utah*, 734 F.3d at 1323 ("It is axiomatic that inventors are the individuals that conceive of the invention . . . ."); *MBO Lab'ys, Inc.*, 602 F.3d at 1309 n.1 ("Individuals, not corporations, create inventions." (citing Beech Aircraft Corp. v. EDO Corp., 990 F.2d 1237, 1248 (Fed. Cir. 1993))).

87. *See infra* Part III.B.

88. *See* U.S. CONST. art. I, § 8, cl. 8.

89. *See id.*; 35 U.S.C. § 101; *Beech Aircraft Corp.*, 990 F.2d at 1248; MPEP § 2157 (9th ed. Rev. 10.2019, June 2020).

90. *See* U.S. CONST. art. I, § 8, cl. 8; 17 U.S.C. § 201(a).

91. Cmty. for Creative Non-Violence v. Reid, 490 U.S. 730, 737 (1989).

medium of expression"[92] and contributes originality to the work.[93] To contribute originality, the work must owe its origin to the author and possess some creative spark.[94] Like the Conception Requirement in inventorship, creativity appears to be a human-only endeavor.[95]

However, unlike patent law, under which the requirement that patent rights vest in the inventor is strictly applied,[96] Congress has carved out an important exception for copyright law.[97] For works "made for hire,"[98] copyright law recognizes that the person who expended the mental work is not necessarily the author.[99] Under the work-for-hire doctrine, "the employer or other person for whom the work was prepared" is considered the author.[100] A work's status as a work made for hire not only affects authorship status,[101] but also affects copyright protection terms.[102]

There are multiple rationales behind Congress carving out an exception for works made for hire. Employers often contribute more to the work by providing resources, gathering creators, and offering ideas.[103] Moreover, transaction costs are also a consideration.[104] There is potential for complications, especially in large transactions, if title initially vests jointly in various contributing agents.[105] Additionally, agents in these situations are often repeat players in the industry and likely have the resources to negotiate with the principals.[106] Therefore, there is less of a worry that the agents will be disadvantaged should the title initially vest in the principal.[107]

---

92. *Id.*

93. Medforms, Inc. v. Healthcare Mgmt. Sols., Inc., 290 F.3d 98, 107–08 (2d Cir. 2002) ("[B]oth tangibility and originality are necessary aspects of authorship. A person is not an author if he has an original idea that is not expressed in tangible form, and a person is not an author if he expresses another's idea in tangible form without any original contribution.").

94. Feist Publ'ns, Inc. v. Rural Tel. Serv. Co., 499 U.S. 340, 346 (1991).

95. *See* U.S. COPYRIGHT OFF., COMPENDIUM OF U.S. COPYRIGHT OFFICE PRACTICES § 306 (3d ed. 2021), https://www.copyright.gov/comp3/docs/compendium.pdf [https://perma.cc/ZN55-6CJA] (stating that copyright "only protects the 'fruits of intellectual labor' that 'are founded in the creative powers of the mind'" (quoting Trade-Mark Cases, 100 U.S. (10 Otto) 82, 94 (1879))).

96. 3 MOY, *supra* note 23, § 10:7; *see also supra* notes 58–61 and accompanying text.

97. *Cmty. for Creative Non-Violence*, 490 U.S. at 737.

98. A work made for hire is one that is (1) prepared by an employee within the scope of their employment or (2) specially ordered or commissioned for use as (a) a contribution to a collective work, (b) a part of a motion picture or other audiovisual work, (c) a translation, (d) a supplementary work, (e) a compilation, (f) an instructional text, (g) a test, (h) an answer material for a test, or (i) an atlas. 17 U.S.C. § 101.

99. *See id.* § 201(b).

100. *Id. See generally* Est. of Burne Hogarth v. Edgar Rice Burroughs, Inc., 342 F.3d 149 (2d Cir. 2003).

101. *See Cmty. for Creative Non-Violence*, 490 U.S. at 737; *see also* 17 U.S.C. § 201(b).

102. *See Cmty. for Creative Non-Violence*, 490 U.S. at 737; *see also* 17 U.S.C. § 302(c).

103. *See* Peter Jaszi, *On the Author Effect: Contemporary Copyright and Collective Creativity*, 10 CARDOZO ARTS & ENT. L.J. 293, 298 (1992).

104. *See* 3 MOY, *supra* note 23, § 10:17.

105. *Id.*

106. *Id.*

107. *Id.*

Many of these rationales are applicable to patent law. For example, in modern technological industries, research and development efforts are often organized by larger business entities in which large numbers of researchers are involved.[108] These researchers are often repeat players in the industry, "hired specifically to invent."[109] However, despite these similarities, the patent system has strictly required the inventor to be the natural person who conceives the invention.[110]

C. AI-Generated Inventions and Inventorship

After exploring the legal background, this Note now turns to provide an overview of AI-generated inventions and the inventorship questions that they raise.

1. AI Machines and Their Inventions

To begin, defining the type of AI machine that this Note focuses on is helpful. An "AI machine" can be defined broadly as a "machine[] that [is] capable of performing tasks that, if performed by a human, would be said to require intelligence."[111] To perform these tasks, most AI machines rely on pattern recognition generated by processing large amounts of data.[112] For example, the AI systems in self-driving cars recognize certain driving patterns from processing data accumulated from millions of miles of driving and implement those driving patterns to control the vehicle.[113] This Note, however, focuses on a specific type of AI machine—one that is capable of generating new patterns and ideas.

An example is Dr. Stephen L. Thaler's "Creativity Machine."[114] Unlike traditional AI machines that merely associate and recognize existing patterns, the Creativity Machine can generate novel patterns that represent new

---

108. *See* Robert P. Merges, *The Law and Economics of Employee Inventions*, 13 HARV. J.L. & TECH. 1, 20–21 (1999).

109. 3 MOY, *supra* note 23, § 10:17.

110. *See* Simmons, *supra* note 50, at 49–50.

111. Matthew U. Scherer, *Regulating Artificial Intelligence Systems: Risks, Challenges, Competencies, and Strategies*, 29 HARV. J.L. & TECH. 353, 362 (2016); *see What Is AI?: Learn About Artificial Intelligence*, ORACLE, https://www.oracle.com/artificial-intelligence/what-is-ai/ [https://perma.cc/85EP-35KN] (last visited Apr. 3, 2023); *see also Artificial Intelligence*, OXFORD ENG. DICTIONARY, https://www.oed.com/view/Entry/271625 [https://perma.cc/XE9N-5YSY] (last visited Apr. 3, 2023).

112. *See Artificial Intelligence: What It Is and Why It Matters*, SAS, https://www.sas.com/en_us/insights/analytics/what-is-artificial-intelligence.html [https://perma.cc/TT6W-UNKT] (last visited Apr. 3, 2023); *see also What Is Artificial Intelligence (AI)?*, IBM, https://www.ibm.com/topics/artificial-intelligence [https://perma.cc/LJ4B-62WU] (last visited Apr. 3, 2023) ("AI algorithms . . . seek to create expert systems which make predictions or classifications based on input data.").

113. *See* Kyle Wiggers, *Uber's 250 Autonomous Cars Have Driven 'Millions' of Miles and Transported 'Tens of Thousands' of Passengers*, VENTUREBEAT (Apr. 11, 2019, 2:05 PM), https://venturebeat.com/2019/04/11/ubers-250-autonomous-cars-have-driven-millions-of-miles-and-transported-tens-of-thousands-of-passengers/ [https://perma.cc/5U7E-HK7P].

114. *See* U.S. Patent No. 5,659,666 col. 1 l. 28 (filed Oct. 13, 1994) (referring to the artificial intelligence system that is being patented as a "creativity machine[]").

ideas.[115] It achieves this through its two neural networks.[116] The first network is trained with the knowledge of a particular field and then injected with random noise.[117] The random noise, or perturbations, are carefully metered to stimulate existing parameters to form new patterns.[118] The second network then acts as a critic and determines whether the output of the first neural network is novel.[119] It also provides feedback to the first neural network on whether it should adjust its perturbations to stimulate better outcomes.[120] If the outcome is determined to be novel by the second neural network, the idea is exported.[121]

Dr. Thaler has compared the two neural networks of the Creativity Machine to the human brain and consciousness.[122] The human brain selects actions through the cortico–basal ganglia–thalamo-cortical loop.[123] The cortex of the brain generates competing outputs, while the basal ganglia select the cortex's outputs based on context.[124] Dr. Thaler argues that the Creativity Machine's first artificial neural network, like the cortex, generates output, while its second artificial neural network, like the basal ganglia, identifies valuable ideas from the first network's output and gives feedback to the cortex.[125] Since its creation in 1994, the Creativity Machine, along with its advanced versions,[126] has written songs,[127] released a music album,[128] created art,[129] and even named the art that it created.[130]

Dr. Thaler's Device for the Autonomous Bootstrapping of Unified Sentience (DABUS) is another AI machine that is capable of generating

---

115. *See IEI's Patented Creativity Machine® Paradigm*, IMAGINATION ENGINES INC., https://imagination-engines.com/cm.html [https://perma.cc/ZYF6-74VS] (last visited Apr. 3, 2023).

116. *See Imagination Engines (a.k.a., "Imagitrons")*, IMAGINATION ENGINES INC., https://imagination-engines.com/ie.html [https://perma.cc/U9XR-9ZCN] (last visited Apr. 3, 2023).

117. *See id.*

118. *See id.*

119. *See id.*

120. *See id.*

121. *See id.*

122. *See* Ryan Abbott, *I Think, Therefore I Invent: Creative Computers and the Future of Patent Law*, 57 B.C. L. REV. 1079, 1084 (2016).

123. *See* P. Redgrave, T.J. Prescott & K. Gurney, *The Basal Ganglia: A Vertebrate Solution to the Selection Problem?*, 89 NEUROSCIENCE 1009, 1015 fig.5 (1999).

124. *See id.*

125. *See* Abbott, *supra* note 122, at 1084–85.

126. *See Imagination Engines (a.k.a., "Imagitrons")*, *supra* note 116 (stating that the Creativity Machine has become more sophisticated with the addition of multiple perturbing neural networks and a plurality of critic and monitoring networks); *see also Patent That Is Arguably the Successor to Deep Learning and the Future of Artificial General Intelligence (AGI)*, ARTIFICIAL INVENTOR, https://artificialinventor.com/dabus-receives-a-us-patent/ [https://perma.cc/KXL2-UCWR] (last visited Apr. 3, 2023).

127. *See Machine Generated Music*, IMAGINATION ENGINES INC., https://imagination-engines.com/cm_music.html [https://perma.cc/Z5YT-QDR6] (last visited Apr. 3, 2023).

128. *See id.*

129. *See Machine Generated Art*, IMAGINATION ENGINES INC., https://imagination-engines.com/cm_art.html [https://perma.cc/Z443-BRBV] (last visited Apr. 3, 2023).

130. *See id.*

inventions.[131] DABUS functions differently from the Creativity Machine.[132] Rather than generating new patterns through optimizing parameters, DABUS creates patterns by autonomously combining simple concepts into complex concept chains and reinforcing desirable chains.[133] "Novelty Filters" then identify novel and meaningful chains that represent new ideas.[134] According to Dr. Thaler, this method provides greater latitude for conceptualization because DABUS can jump from idea to idea and is not constrained by the parameters that it is trained with.[135] Two important underlying differences between DABUS and other AI machines are that DABUS is not instructed what to invent due to its ability to jump from concept to concept[136] and that DABUS is capable of identifying novel ideas on its own because of the Novelty Filter.[137]

Dr. Thaler's AI machines are not the only sources of AI-generated inventions.[138] For example, Dr. John R. Koza's "Invention Machine" autonomously generated a "system to make factories more efficient" using

131. *See* Blake Brittain, *U.S. Scientist Hits Another Dead End in Patent Case over AI 'Inventor,'* REUTERS (Oct. 20, 2022, 3:58 PM), https://www.reuters.com/legal/litigation/us-scientist-hits-another-dead-end-patent-case-over-ai-inventor-2022-10-20/ [https://perma.cc/4C7G-SYJ8]; *see also DABUS Described*, IMAGINATION ENGINES INC., https://imagination-engines.com/dabus.html [https://perma.cc/PB52-PBAU] (last visited Apr. 3, 2023); *Patent That Is Arguably the Successor to Deep Learning and the Future of Artificial General Intelligence (AGI)*, *supra* note 126.

132. *See DABUS Described*, *supra* note 131.

133. *See id.*

134. *See id.*

135. *See id.* The way in which the Creativity Machine and DABUS would create a new toothbrush design demonstrate how the two machines operate differently. The Creativity Machine would achieve the optimization of a new toothbrush design "through the constrained variation of the brush's design parameters, the number, grouping, inclination, stiffness of bristles, etc." *Id.* If DABUS were to come up with the same idea, its process would have jumped from idea to idea by grouping concepts. For example, it might group the concepts of "hog whiskers," "embedding," and "bamboo stalk" together to form the more complex concept of a new toothbrush design. *See id.*

136. Nevertheless, the user can confine DABUS's knowledge to a specific area so it can focus only on identifying novel patterns in that area. *See* Perpetual Motion Podcast, *Are All Inventors Humans?*, IHEART RADIO, at 26:35 (July 8, 2020), https://www.iheart.com/podcast/966-perpetual-motion-podcast-69966811/episode/are-all-inventors-human-episode-69976714/ [https://perma.cc/R49R-5KN8].

137. *See DABUS Described*, *supra* note 131.

138. *See, e.g.*, Michael McLaughlin, *Computer-Generated Inventions*, 101 J. PAT. & TRADEMARK OFF. SOC'Y 224, 238 (2019) (categorizing Google's AutoML, an AI that creates more sophisticated AI, as a source of computer-generated inventions); Rachel L. Schwein, Note, *Patentability and Inventorship of AI-Generated Inventions*, 60 WASHBURN L.J. 561, 569–72 (2021) (listing examples of sources of AI-generated inventions, including NASA Ames Research Center's evolutionary algorithms that created a small antenna, an AI called "Dreamcatcher" that was built to design the ideal vehicle, and Dr. Thaler's DABUS).

genetic algorithms.[139] As opposed to AI-assisted inventions,[140] for which substantial human intervention is required, inventions generated by these creative machines require little, if any, human input.[141] Indeed, Dr. Thaler argues that neither the creator nor the user of DABUS really conceives the invention.[142] They do not even have to be familiar with the field.[143] In fact, when Dr. Thaler filed a patent application to seek protection for a food container generated by DABUS, he listed DABUS as the only inventor.[144] As technology improves, more and more inventions generated by AI will require little, if any, human input.[145] When these creative machines create patentable subject matter without human intervention, are the machines the legal inventors?

2. Inventorship Issues of AI-Generated Inventions

In response to that question, the Federal Circuit answered in the negative.[146] The court in *Thaler v. Vidal*[147] held that an AI machine cannot be an inventor under patent law because it is not a natural person.[148]

---

139. Jonathon Keats, *John Koza Has Built an Invention Machine*, POPULAR SCI. (Apr. 19, 2006, 10:00 AM), https://www.popsci.com/scitech/article/2006-04/john-koza-has-built-invention-machine/ [https://perma.cc/U6CR-233P]; *see also* Abbott, *supra* note 122, at 1086–91 (listing the Invention Machine and IBM's Watson as examples of creative computers—i.e., AI machines that generate inventions). Genetic algorithms are "mathematically simulated genes" that are randomly combined and mutated to produce "new potential offspring" that, in turn, represent new concepts. *IEI's Patented Creativity Machine® Paradigm*, *supra* note 115.

140. AI-assisted inventions are inventions "made with significant human intervention with the aid of AI." Christian E. Mammen, *Artificial Intelligence and Patent Law: What Happens After DABUS?*, NAT'L L. REV. (Aug. 13, 2020), https://www.natlawreview.com/article/artificial-intelligence-and-patent-law-what-happens-after-dabus [https://perma.cc/9755-YEB7]. "For example, a life sciences inventor may use AI software" to assist in drug development. *Id.*

141. *See* Abbott, *supra* note 122, at 1084–85. However, in some cases, it may be hard to determine whether the AI merely assisted in creating the invention or actually created the invention without substantial human intervention. *See* Frank A. DeCosta, *Drawing a 'Bright Line' Rule over AI Inventorship*, FINNEGAN (Aug. 16, 2022), https://www.finnegan.com/en/insights/articles/drawing-a-bright-line-rule-over-ai-inventorship.html [https://perma.cc/9ELV-7P9X] (stating that specific facts determine whether an AI is used as a mere tool or is substantially relied on).

142. *See* Thaler v. Vidal, 43 F.4th 1207, 1209 (Fed. Cir. 2022) (stating that Dr. Thaler argued that he "did not contribute to the conception of [the AI's] inventions and that any person having skill in the art could have taken DABUS's output and reduced the ideas in the applications to practice"), *petition for cert. filed*, No. 22-919 (U.S. Mar. 21, 2023).

143. *See id.*

144. *See id.* at 1209–10. DABUS created two inventions for which patent applications have been filed. One is a container for food or beverages that makes tight packing and grasping by robotic arm easier, and the other is a light that flickers in a unique way that better attracts people's attention. *See In re* Application of Application No. 16/524,350, 2020 Dec. Comm'r Pat. No. 50567-3-01-US (Apr. 22, 2020); *see also Thaler*, 43 F.4th at 1209.

145. *See* McLaughlin, *supra* note 138, at 226–27.

146. *Thaler*, 43 F.4th at 1209.

147. 43 F.4th 1207 (Fed. Cir. 2022), *petition for cert. filed*, No. 22-919 (U.S. Mar. 21, 2023).

148. *See id.* at 1213.

Following its own precedent, the court[149] interpreted "individual" in the statutory definition of an inventor[150] as referring only to natural persons.[151] The court based its decision on the plain meaning of the statute—"[T]here is no ambiguity: the Patent Act requires that inventors must be natural persons; that is, human beings."[152] The court did not further discuss whether this decision facilitated the goals of the patent system[153] or whether AI machines have rights to their inventions.[154]

Although the decision in *Thaler* provides a bright-line rule of requiring a human inventor, questions regarding AI inventorship still remain.[155] For example, the court did not decide what level of reliance on AI is needed in the inventive process to deprive a human of inventorship.[156] Other questions revolve around ownership: Who owns the AI-generated invention?[157] Is it the user, the AI's owner, or the AI's creator?[158] If the owner of the AI owns the invention, how do we determine who the owner of the AI is?[159] What happens if the AI has no owner?[160]

Recognizing the importance of AI-generated intellectual property, Senators Chris Coons and Thom Tillis sent a letter to USPTO director Kathi Vidal and register of copyrights Shira Perlmutter asking how best to incentivize "robust development of AI and AI-generated inventions moving forward."[161] The senators believed that the USPTO and the courts had

149. *See id.* at 1212; *see also* Univ. of Utah v. Max-Planck-Gesellschaft zur Forderung der Wissenschaften E.V., 734 F.3d 1315, 1323 (Fed. Cir. 2013); Beech Aircraft Corp. v. EDO Corp., 990 F.2d 1237, 1248 (Fed. Cir. 1993).

150. *See* 35 U.S.C. § 100(f) (defining inventor as "the individual . . . who invented or discovered the invention"). Other sections also refer to inventors as "individuals." *See, e.g.*, *id.* §§ 100(g), 115.

151. *See Thaler*, 43 F.4th at 1211–12; *see also* Mohamad v. Palestinian Auth., 566 U.S. 449, 454–55 (2012) (stating that when used as a noun, "'individual' ordinarily means '[a] human being'" unless there is "*some* indication [that] Congress intended" a different meaning (first alteration in original) (quoting 7 OXFORD ENGLISH DICTIONARY 880 (2d ed. 1989))).

152. *Thaler*, 43 F.4th at 1210.

153. *See id.* at 1213.

154. *See id.* at 1209.

155. *See* DeCosta, *supra* note 141; *see also* Mammen, *supra* note 140.

156. *See* DeCosta, *supra* note 141.

157. *See* Mammen, *supra* note 140; Kaitlyn Taylor, *The Patentability of Inventions with Artificial Intelligence Listed as an Inventor Following* Thaler v. Hirshfeld, 6 U. CIN. INTELL. PROP. & COMPUT. L.J., no. 2, 2022, at 1, 12.

158. *See* Ben Kovach, *Ostrich with Its Head in the Sand: The Law, Inventorship, and Artificial Intelligence*, 19 NW. J. TECH. & INTELL. PROP. 137, 148–51 (2021).

159. *See* Mammen, *supra* note 140.

160. *See* Kovach, *supra* note 158, at 148–51.

161. Letter from Thom Tillis, Sen., and Chris Coons, Sen., to Kathi Vidal, Under Sec'y of Com. for Intell. Prop. & Dir. of the U.S. Pat. & Trademark Off., and Shira Perlmutter, Register of Copyrights & Dir. of the U.S. Copyright Off. (Oct. 27, 2022), https://www.copyright.gov/laws/hearings/Letter-to-USPTO-USCO-on-National-Commission-on-AI-1.pdf [https://perma.cc/847F-AYV4]; *see also* Franklin Graves, *AI Year in Review: A Busy 2022 for AI and IP Promises Even More in 2023*, IPWATCHDOG (Dec. 18, 2022), https://ipwatchdog.com/2022/12/18/ai-year-in-review-a-busy-2022-for-ai-and-ip-promises-even-more-in-2023/id=154005/ [https://perma.cc/N6HK-23JW]; Britain Eakin, *Sens. Coons, Tillis Seek Commission on AI-Generated IP*, LAW360 (Oct. 31, 2022,

reached the correct decision in requiring a human to be an inventor under current patent law, but they urged the USPTO to look into possible legal frameworks that would best protect AI-generated inventions.[162] In response, the USPTO emphasized its efforts in monitoring the impacts of *Thaler*[163] and its plans to continue hosting events discussing how AI will interact with the intellectual property system.[164] More recently, the USPTO has requested comments regarding AI and inventorship, asking questions such as whether an invention is patentable if "an AI system contributes to an invention at the same level as a human who would be considered a joint inventor" and whether the USPTO needs "to expand its current guidance on inventorship to address situations in which AI significantly contributes to an invention."[165]

As AI technology advances and becomes more accessible, more issues are sure to surface.[166] However, this Note does not intend to cover all these issues. Rather, it focuses on the immediate question raised after *Thaler*: If AI cannot be the inventor of an AI-generated invention, can a natural person take its place as the legal inventor? That is, if Thaler had listed himself as the inventor of the inventions generated by DABUS instead, would it have been upheld in court?

II. IS THERE AN INVENTORSHIP GAP IN AI-GENERATED INVENTIONS?

Whether a natural person can be the legal inventor of AI-generated inventions is a pressing issue because the answer to this question decides whether AI-generated inventions are patentable at all,[167] which further affects how AI industry players strategize.[168] *Thaler* ruled out the possibility

---

7:08 PM), https://www.law360.com/articles/1545066/sens-coons-tillis-seek-commission-on-ai-generated-ip [https://perma.cc/3A79-J2CD].

162. *See* Letter from Thom Tillis & Chris Coons, *supra* note 161.

163. *See* Letter from Kathi Vidal, Under Sec'y of Com. for Intell. Prop. & Dir. of the U.S. Pat. & Trademark Off., and Shira Perlmutter, Register of Copyrights & Dir. of the U.S. Copyright Off., to Thom Tillis, Sen., and Chris Coons, Sen. (Dec. 12, 2022), https://www.copyright.gov/laws/hearings/Letter-to-USPTO-USCO-on-National-Commission-on-AI-1.pdf [https://perma.cc/GJ5K-SZJQ]; *see also* Graves, *supra* note 161.

164. *See, e.g.*, *AI and Emerging Technology Partnership Engagement and Events*, U.S. PAT. & TRADEMARK OFF., https://www.uspto.gov/initiatives/artificial-intelligence/ai-and-emerging-technology-partnership-engagement-and-events [https://perma.cc/HDP4-FGQ3] (last visited Apr. 3, 2023).

165. Request for Comments Regarding Artificial Intelligence and Inventorship, 88 Fed. Reg. 9492 (Feb. 14, 2023).

166. Ji Mao, *Revisiting AI Inventorship in* Thaler v. Vidal, HOLLAND & KNIGHT IP/DECODE BLOG (Oct. 4, 2022), https://www.hklaw.com/en/insights/publications/2022/10/revisiting-ai-inteventorship-in-thaler-v-vidal [https://perma.cc/3VQC-T3C7].

167. If AI-generated inventions have no inventors, then no patent rights exist for those inventions because patent rights vest only in the inventor. *See supra* note 54 and accompanying text.

168. *See* Erik Weibust & Dean A. Pelletier, *Protecting AI-Generated Inventions as Trade Secrets Requires Protecting the Generative AI as Well*, IPWATCHDOG (July 24, 2022), https://ipwatchdog.com/2022/07/24/protecting-ai-generated-inventions-trade-secrets-requires-protecting-generative-ai-well/id=150372/ [https://perma.cc/649G-DGRA] ("The U.S. Patent Act currently does not offer protection for AI-generated inventions where AI is the only named inventor. Because of that void, trade secret protection for AI-generated inventions may become more popular.").

of naming AI machines as legal inventors.[169] Therefore, if natural persons cannot be legal inventors of AI-generated inventions, no one can be. This will result in a gap in inventorship that excludes an entire area of technology from patent protection.

Although no cases have addressed whether natural persons can be legal inventors for AI-generated inventions, two doctrines might resolve this issue: (1) the doctrine of simultaneous conception and reduction to practice[170] and (2) the doctrine of first to recognize and appreciate.[171]

Part II.A will discuss the arguments for and against applying the doctrine of simultaneous conception and reduction to practice, in order to assign inventorship to natural persons for AI-generated inventions. Part II.B will cover the same issues with respect to the doctrine of first to recognize and appreciate.[172]

A. Doctrine of Simultaneous Conception and Reduction to Practice

It is the U.S. Supreme Court's view that a "patentable invention is a mental result."[173] In keeping with this view, courts have held that an invention is created when it is conceived of by the inventors and not necessarily when the conception is physically embodied, i.e., "reduced to practice."[174] However, in some "unpredictable areas of chemistry and biology, there is no conception until the invention has been reduced to practice."[175] This rule is known as the doctrine of simultaneous conception and reduction to practice.[176] The rationale behind this doctrine is that the inventor cannot formulate a "complete and operative invention"[177] until it is physically embodied due to the uncertain nature of some inventions.[178]

---

169. Thaler v. Vidal, 43 F.4th 1207, 1213 (Fed. Cir. 2022), *petition for cert. filed*, No. 22-919 (U.S. Mar. 21, 2023).

170. *See* Dan L. Burk, *AI Patents and the Self-Assembling Machine*, 105 MINN. L. REV. HEADNOTES 301, 308 (2021); Schwein, *supra* note 138, at 579–80; David L. Schwartz & Max Rogers, *"Inventorless" Inventions?: The Constitutional Conundrum of AI-Produced Inventions*, 35 HARV. J.L. & TECH. 531, 570 (2022).

171. *See* Schwein, *supra* note 138, at 580–81; Abbott, *supra* note 122, at 1097–98.

172. Before delving into the weeds, it is important to reiterate that the focus of this Note is on AI machines like DABUS—those that are capable of creating inventions independent of human intervention—as AI is a very broad field that encompasses different types of technologies with varying applications. *See What Is Artificial Intelligence (AI)?*, *supra* note 112. Therefore, for the purposes of this Note, Parts II and III will simply refer to AI machines that are capable of generating inventions without human intervention as "AI machines." *See supra* notes 140–41 and accompanying text.

173. Smith v. Nichols, 88 U.S. (21 Wall.) 112, 118 (1874); Burt v. Evory, 133 U.S. 349, 358 (1890).

174. 4 ROBERT A. MATTHEWS, JR., ANNOTATED PATENT DIGEST § 26:10 (2022); *see also* Sewall v. Walters, 21 F.3d 411, 415 (Fed. Cir. 1994) (stating that determining who is the inventor "is nothing more than determining who conceived the subject matter at issue").

175. MacMillan v. Moffett, 432 F.2d 1237, 1240 (C.C.P.A. 1970).

176. *See id.*

177. Singh v. Brake, 317 F.3d 1334, 1340 (Fed. Cir. 2003).

178. *See MacMillan*, 432 F.2d at 1240.

For example, the Federal Circuit in *Amgen, Inc. v. Chugai Pharmaceutical Co.*[179] concluded that a novel, isolated genetic sequence encoding erythropoietin was not conceived by the inventors until the gene was isolated.[180] Conception does not occur unless one has a mental picture of the structure or is able to define characteristics that sufficiently distinguish it.[181] The court reasoned that since the inventors could neither know the physical characteristics of the gene nor have a viable method of obtaining that gene until it was actually isolated, the gene was not conceived of until it was reduced to practice.[182]

1. Analogizing AI-Generated Inventions to Unpredictable Areas of Biology

Proponents of applying the doctrine of simultaneous conception and reduction to practice to AI-generated inventions note the similarities between AI-generated inventions and unpredictable areas within chemistry and biology.[183] Professor Dan L. Burk, a strong proponent of applying the doctrine to AI-generated inventions, offers a helpful analogy with monoclonal antibodies.[184] Monoclonal antibodies are artificial proteins that bind to materials unrecognized by the immune system (known as antigens), in order to destroy them[185] and can be used for the diagnosis and treatment of diseases.[186] They are produced by artificially created cells called hybridomas, a fusion of antibody-producing B cells and cancer cells.[187] However, not all hybridomas produce the desired antibody, so screening for hybridomas that generate antibodies that bind to the antigen of interest is necessary.[188] Before the desired hybridomas are identified, the antibodies that they produce are unforeseeable and unpredictable.[189] However, those skilled in the art will be able to identify the antibodies' proper characteristics and thus can complete conception once the antibodies are produced, that is, reduced to practice.[190] The fact that the antibody is unpredictable and that

179. 927 F.2d 1200 (Fed. Cir. 1991).
180. *See id.* at 1206.
181. *See id.*
182. *Id.*
183. *See generally* Burk, *supra* note 170. *See also* Schwein, *supra* note 138, at 580.
184. *See* Burk, *supra* note 170, at 304–05, 308.
185. *Monoclonal Antibodies*, CLEVELAND CLINIC, https://my.clevelandclinic.org/health/treatments/22246-monoclonal-antibodies [https://perma.cc/N5YB-NULN] (last visited Apr. 3, 2023).
186. Mitchell Berger, Vidya Shankar & Abbas Vafai, *Therapeutic Applications of Monoclonal Antibodies*, 324 AM. J. MED. SCIS. 14, 14 (2002).
187. Mark Pogson, Cristina Parola, William J. Kelton, Paul Heuberger & Sai T. Reddy, *Immunogenomic Engineering of a Plug-and-(Dis)play Hybridoma Platform*, NATURE COMMC'NS, Aug. 17, 2016, at 2, art. no. 12535.
188. *See* Alessandro Pedrioli1 & Annette Oxenius, *Single B Cell Technologies for Monoclonal Antibody Discovery*, 42 TRENDS IMMUNOLOGY 1143, 1144–45 (2021) (outlining specific steps for hybridoma screening).
189. *See* Burk, *supra* note 170, at 305.
190. *Id.*

"the complete and operative invention"[191] cannot be formulated before it is reduced to practice does not impede its patentability.[192]

Professor Burk argues that, similarly to monoclonal antibodies, AI-generated inventions are unpredictable before they are reduced to practice.[193] The nature and characteristics of an AI-generated invention cannot be discerned until it is generated, but a skilled person would be able to identify the invention.[194] Therefore, AI machines are merely like hybridomas—both generate unpredictable results that are not conceived as inventions until they are screened by humans who recognize their nature and value.[195] Like monoclonal antibodies, an AI-generated invention only becomes an invention after a person perceives the AI's output.[196] Professor Burk argues that since there have never been issues with listing the natural persons who identify the monoclonal antibodies as inventors,[197] the same should be true for AI-generated inventions.[198]

2. Autonomous Recognition and the Limits of the Doctrine of Simultaneous Conception and Reduction to Practice

However, not all scholars agree that the doctrine of simultaneous conception and reduction to practice applies to all AI-generated inventions.[199] Those who disagree argue that the lack of human intervention in DABUS's inventing process is a critical difference between unpredictable areas of chemistry and biology.[200] For example, Professor David L. Schwartz and Max Rogers question the doctrine's applicability in instances in which little to no human discernment is required to recognize the AI-generated invention.[201] Similarly, Rachel L. Schwein argues that the doctrine does not apply to autonomous AI machines like DABUS.[202]

---

191. Singh v. Brake, 317 F.3d 1334, 1340 (Fed. Cir. 2003).

192. *See, e.g.*, Monoclonal Antibody and Use Thereof, U.S. Patent No. 8,338,379 (filed Sept. 23, 2010) (issued Dec. 25, 2012).

193. *See* Burk, *supra* note 170, at 308.

194. *Id.*

195. *Id.*

196. *Id.*; *see also* Schwein, *supra* note 138, at 597 ("Before the computer produces a result, the idea is too abstract for the invention to be considered 'conceived.' After the computer produces the result, the invention is not only conceived, but also reduced to practice.").

197. *See* Burk, *supra* note 170, at 308; *see also, e.g.*, '379 Patent.

198. Burk, *supra* note 170, at 308.

199. *See, e.g.*, Schwartz & Rogers, *supra* note 170, at 570 (asking whether the human conceived of the invention in a meaningful sense if AI reduces the level of human discernment required to identify an invention); Schwein, *supra* note 138, at 598–600 (stating that the doctrine of simultaneous conception and reduction to practice applies to AI inventions when humans provide certain guidance, but arguing that a different doctrine—the doctrine of first to recognize and appreciate—should apply to inventions generated by autonomous AI machines like DABUS).

200. *See* Schwartz & Rogers, *supra* note 170, at 570; *see also* Schwein, *supra* note 138, at 598–600.

201. Schwartz & Rogers, *supra* note 170, at 570.

202. Schwein, *supra* note 138, at 598–600.

As Professor Schwartz and Rogers have pointed out, the simultaneous conception and reduction to practice doctrine assumes that conception does not occur until an invention is reduced to practice.[203] However, this is not necessarily true for AI machines like DABUS.[204] One of DABUS's underlying differences from other AI machines is its ability to recognize the novelty of its inventions.[205] Therefore, when DABUS exports its invention, novelty would have already been recognized by DABUS, which—Professor Schwartz and Rogers argue—renders subsequent human discernment redundant.[206] Essentially, Professor Schwartz and Rogers argue that Professor Burk's analogy fails because the AI has effectively replaced the human "inventor" who screens for the antibody in that analogy.[207] As Schwein acknowledges, the doctrine of simultaneous conception and reduction to practice may apply to particular inventions using AI assistance.[208] However, the doctrine should not apply to independent and autonomous AI machines like DABUS.[209]

B. Doctrine of First to Recognize and Appreciate

Another doctrine that could apply to AI-generated inventions is the doctrine of first to recognize and appreciate.[210] The doctrine was initially developed to determine priority—i.e., who invented the invention first—in pre-AIA cases.[211] However, since inventorship is still determined by conception under the AIA, pre-AIA cases discussing conception remain highly relevant.[212]

Under the doctrine of first to appreciate, the person who first appreciates the invention is deemed the inventor.[213] For example, in *Heard v. Burton*,[214] the parties contested who first invented eta-alumina, a new form of

---

203. Schwartz & Rogers, *supra* note 170, at 570.
204. *Id.*
205. *DABUS Described*, *supra* note 131.
206. Schwartz & Rogers, *supra* note 170, at 570.
207. *See supra* notes 193–98 and accompanying text.
208. *See* Schwein, *supra* note 138, at 598–99.
209. *Id.*; *see also* Corrected Opening Brief for Plaintiff-Appellant Stephen Thaler at 7–8, Thaler v. Vidal, 43 F.4th 1207 (Fed. Cir. 2022) (No. 20-CV-00903), ECF No. 5 (arguing that the nature of DABUS's invention is different from inventions for which significant human intervention is still required).
210. *See, e.g.*, Schwein, *supra* note 138, at 580–81; Abbott, *supra* note 122, at 1098, 1103–05, 1108–13 (raising the possibility of applying the doctrine of first to recognize and appreciate but ultimately arguing against applying the doctrine due to policy reasons).
211. Before the AIA, a person was not entitled to a patent if another inventor made the invention first, regardless of whether the person applied for a patent before the other inventor. 35 U.S.C. § 102(g) (1999). Therefore, courts have extensively analyzed when conception is complete to determine which party conceived of the invention first and is thus entitled to inventorship. *See supra* Part I.B.2.
212. *See* Kaelyn R. Knutson, *Anything You Can Do, AI Can't Do Better: An Analysis of Conception as a Requirement for Patent Inventorship and a Rationale for Excluding AI Inventors*, 11 CYBARIS, no. 2, 2020, at 1, 15.
213. Schwein, *supra* note 138, at 580–81.
214. 333 F.2d 239 (C.C.P.A. 1964).

alumina.[215] Burton filed a patent application first, but Heard claimed to have previously discovered and reduced the invention to practice.[216] In 1949, Heard made a catalyst but did not realize that the catalyst contained eta-alumina.[217] Even though Heard recognized that the catalyst was effective, he did not know that it contained any type of alumina different from what was already known at the time.[218] It was not until 1954—two years after Burton's patent filing date—that Heard recognized that he had created a new form of alumina.[219]

The court held that Heard did not conceive of eta-alumina until he recognized that it was present in his catalyst.[220] Therefore, Heard did not complete his invention until 1954, even though he physically created the eta-alumina in 1949.[221] The court reasoned that to have a "definite and permanent idea of the complete and operative invention"[222] as to constitute conception, recognition and appreciation are required.[223] That is, there can be no conception without contemporaneous recognition and appreciation of the invention.[224] As a result, the court awarded Burton priority of the eta-alumina invention, as Heard's "recognition and appreciation of the invention . . . was lacking."[225]

1. Natural Persons Complete Conception Through Appreciation

Scholars argue that a human can be the legal inventor of an AI-generated invention for merely appreciating the value of the invention under the doctrine of first to recognize and appreciate.[226] This is because, as Schwein argues, "an AI system is incapable of performing the requisite mental act of recognizing and appreciating inventive subject matter."[227] Therefore, conception is not complete until the AI-generated invention is appreciated by a natural person.[228]

Applying this reasoning, proponents of applying the first-to-appreciate doctrine are essentially arguing that AI-generated inventions are analogous to the inventions in cases like *Heard*.[229] The AI machine is like Heard, as

---

215. Heard v. Burton, 333 F.2d 239, 240–41 (C.C.P.A. 1964).
216. *Id.* at 240.
217. *Id.*
218. *Id.*
219. *Id.* at 242.
220. *Id.* at 242–43.
221. *Id.*
222. *Id.* at 243 (quoting Townsend v. Smith, 36 F.2d 292, 295 (C.C.P.A. 1929)).
223. *Id.*
224. Invitrogen Corp. v. Clontech Lab'ys, Inc., 429 F.3d 1052, 1063 (Fed. Cir. 2005).
225. *Heard*, 333 F.2d at 244.
226. *See* Schwein, *supra* note 138, at 580–81; Abbott, *supra* note 122, at 1098 (stating that if an AI machine cannot be the legal inventor of its creation, the person who mentally recognizes and appreciates the creation's significance would likely qualify as an inventor). *But see id.* at 1103–05, 1108–13 (arguing against applying the doctrine of first to appreciate due to policy reasons).
227. Schwein, *supra* note 138, at 580–81.
228. *Id.*
229. *See id.*

they both created inventions that they did not or could not appreciate.[230] Moreover, the person who subsequently recognizes the AI-generated invention is like Burton, since they both recognized and appreciated the invention.[231] Because Burton was entitled to inventorship, the natural person recognizing and appreciating the AI-generated invention should be entitled to inventorship as well.

The applicability of the first-to-appreciate doctrine rests on the argument that AI is incapable of conceiving an invention.[232] As proponents have argued, conception is a purely *human* mental act; no other entity, including an AI machine, is capable of conception.[233] The USPTO appears to endorse this view as well.[234] It denied Thaler's petition to name DABUS as an inventor by asserting that DABUS, like states[235] and corporations,[236] are not natural persons and are thus incapable of conception.[237] The USPTO, however, did not directly address DABUS's capabilities and only concluded that AI machines are incapable of conception based on the fact that they are not natural persons.[238]

Kaelyn R. Knutson also offers a scientific perspective of conception to support the view that AI is incapable of conception.[239] She argues that artificial neural networks simply do not replicate the human nervous system's dynamic complexity.[240] Moreover, from an evolutionary perspective, human cognition emerged as "a set of social skills under cooperative and prosocial evolutionary motivations."[241] Thus, without accurately reproducing the social conditions under which our species evolved, AI is not even close to replicating human cognition.[242] The law should not "tolerate the bald assertion that AI could potentially replicate human cognition" and deem AI as capable of conception.[243] Therefore, as Schwein argues, the first natural

230. *Cf. Heard*, 333 F.2d at 244 (awarding Burton priority of the invention because Heard's "recognition and appreciation of the invention . . . was lacking").

231. *Cf. id.*

232. *Id.*

233. *Id.*; *see also* Knutson, *supra* note 212, at 11.

234. *See In re* Application of Application No. 16/524,350, 2020 Dec. Comm'r Pat. No. 50567-3-01-USA (Apr. 22, 2020).

235. Univ. of Utah v. Max-Planck-Gesellschaft zur Forderung der Wissenschaften E.V., 734 F.3d 1315, 1323 (Fed. Cir. 2013) ("To perform this mental act [of conception], inventors must be natural persons and cannot be corporations or sovereigns.").

236. Beech Aircraft Corp. v. EDO Corp., 990 F.2d 1237, 1248 (Fed. Cir. 1993) (stating that corporate assignees cannot be inventors because "only natural persons can be 'inventors'" (quoting 35 U.S.C. §§ 115–118)).

237. *See In re* Application of Application No. 16/524,350, 2020 Dec. Comm'r Pat. No. 50567-3-01-USA.

238. *See id.*; *see also* Justyn Millamena, Note, *How Artificial Intelligence Machines Can Legally Become Inventors: An Examination of and Solution to the Decision on DABUS*, 30 J.L. & POL'Y 270, 284 (2021).

239. Knutson, *supra* note 212, at 11.

240. *Id.* at 23–24.

241. *Id.* at 24; *see also* Evan L. MacLean, *Unraveling the Evolution of Uniquely Human Cognition*, 113 PNAS 6348, 6352 (2016).

242. Knutson, *supra* note 212, at 24.

243. *Id.*

person who appreciates the invention is necessarily the one who conceives it because the AI could never have conceived it in the first place.[244] Furthermore, from a policy standpoint, the AI invention does not provide any benefit to society without the person appreciating the invention.[245] Therefore, by awarding patent rights to those that appreciate the AI-generated inventions, society incentivizes the introduction of those inventions.[246]

2. Appreciation Insufficient for Inventorship

However, the applicability of the doctrine of first to recognize and appreciate to AI-generated inventions is not without criticism. Some critics argue that the doctrine of first to appreciate is not applicable because AI machines like DABUS are capable of conception.[247] They claim that it is problematic for the USPTO to attach such weight to the ambiguous phrase of "formation in the mind" in concluding that AI cannot conceive because, although minds are often associated with human brains, they consist of the same internal structures as AI neural networks.[248] If AI machines are capable of conception, a natural person cannot be the inventor of AI-generated inventions, even though AI machines cannot be inventors themselves. Indeed, under current patent law, one cannot be an inventor if they derived the invention from another—in this case, AI machines—even if the invention was not disclosed to the public.[249]

Scholars who argue against applying the doctrine rely mostly on policy arguments.[250] For example, Professor Ryan Abbott, a strong proponent for AI inventorship, argues that the first-to-appreciate doctrine does not necessarily incentivize the right people.[251] It is possible that the person who first appreciates the AI-generated invention did not significantly contribute

---

244. Schwein, *supra* note 138, at 563.

245. *See id.*

246. *See id.*

247. *See, e.g.*, Millamena, *supra* note 238, at 289–91 (arguing that DABUS should satisfy the Conception Requirement); Anna Carnochan Comer, *AI: Artificial Inventor or the Real Deal?*, 22 N.C. J.L. & TECH. 447, 466–67 (2021) (arguing that USPTO employed "a cyclical and fallacious" reasoning when interpreting inventor and conception to exclude AI and that "current patent law is radically unequipped to deal with technological advancements in the field of AI").

248. Comer, *supra* note 247, at 465; *see also* Millamena, *supra* note 238, at 289–91 (arguing that DABUS conceived inventions "in its own *mind*" because the way its artificial neural nets function is the same as a human brain (emphasis added)).

249. 35 U.S.C. § 101 ("*Whoever* invents . . . may obtain a patent therefor . . . ." (emphasis added)); *see also* TUROSKI, *supra* note 42, § 2:14; MacMillan v. Moffett, 432 F.2d 1237, 1240 (C.C.P.A. 1970) (stating that the doctrine of simultaneous conception and reduction to practice does not apply when the issue is originality (citing Applegate v. Scherer, 332 F.2d 571 (C.C.P.A. 1964))).

250. *See* Abbott, *supra* note 122, at 1104 (acknowledging that natural persons may become inventors under the doctrine of first to recognize and appreciate but ultimately arguing against applying the doctrine because doing so does not facilitate the goals of the patent system); *see also* Tim W. Dornis, *Artificial Intelligence and Innovation: The End of Patent Law as We Know It*, 23 YALE J.L. & TECH. 97, 124 (2020).

251. *See* Abbott, *supra* note 122, at 1104.

to the invention.[252] Professor Abbott offers the example of a visitor in someone's home who accidentally comes across an AI-generated invention.[253] He argues that the first-to-appreciate doctrine awards patent rights to someone who did not participate in the inventive process.[254] Doing so does not facilitate patent law's goals of incentivizing the creation of invention.[255] Moreover, awarding patents to those merely appreciating or introducing inventions may encourage people to monitor the activity of others instead of utilizing their own AI machines.[256]

In his article about how AI will disrupt the patent system, Professor Tim W. Dornis also opposes applying the first-to-appreciate doctrine because of its unpredictability.[257] The dispute over who is the one actor that recognized the invention is immense and will be costly to society.[258] Therefore, critics contend that the doctrine of first to recognize and appreciate probably is not as readily applicable to AI-generated inventions as proponents claim.

III. BRIDGING THE AI INVENTORSHIP GAP

Whether there is an inventorship gap in AI-generated inventions boils down to whether an AI machine prevents a natural person from conceiving the invention. If not, then the natural person can still be the legal inventor of the AI-generated invention. But if it does, then no one can conceive of the invention, thereby creating a gap in inventorship and rendering the invention unpatentable. Both doctrines discussed in Part II seek to bridge this gap. The doctrine of simultaneous conception and reduction to practice seeks to do so by arguing that a human still conceives of the AI-generated invention because all that the AI machine does is produce an invention that was unpredictable from the beginning.[259] The doctrine of first to recognize and appreciate seeks to do so by arguing that a human still conceives of the AI-generated invention by appreciating the value of the invention.[260]

Part III.A argues that neither of these doctrines bridges this gap and that the inventorship gap in AI-generated inventions does exist. However, as a matter of policy, AI-generated inventions should be patentable.[261]

---

252. *See* Dornis, *supra* note 250, at 124 (arguing that applying the first-to-recognize doctrine "decouples invention and right ownership" and that doing so makes it hard to "grant rights to the actually deserving 'inventive' actor or actors"); *see also* Abbott, *supra* note 122, at 1104.

253. *See* Abbott, *supra* note 122, at 1104.

254. *See id.*

255. *See id.*

256. *See* 2 MOY, *supra* note 23, § 8:3 (stating that excluding "derivers"—persons introducing inventions—from being inventors prevents people from merely monitoring others' activities).

257. *See* Dornis, *supra* note 250, at 124; *see also* Liza Vertinsky, *Thinking Machines and Patent Law*, *in* RESEARCH HANDBOOK ON THE LAW OF ARTIFICIAL INTELLIGENCE 489, 506 (Woodrow Barfield & Ugo Pagallo eds., 2018).

258. Dornis, *supra* note 250, at 124.

259. *See supra* Part II.A.1.

260. *See supra* Part II.B.1.

261. *See* Kovach, *supra* note 158, at 151.

Therefore, it is crucial that the law allow natural persons to be legal inventors of AI-generated inventions to bridge the inventorship gap. Part III.B argues that Congress should repurpose copyright law's work-for-hire doctrine and recognize the natural person who uses the AI machine as the legal inventor of those inventions. Doing so not only bridges the inventorship gap in AI-generated inventions, thereby ensuring that AI-generated inventions are patentable, but also makes inventorship determinations more predictable.

A. The AI Inventorship Gap

Neither the doctrine of simultaneous conception and reduction to practice nor the doctrine of first to recognize and appreciate bridges the inventorship gap in AI-generated inventions. This section explains why.

The doctrine of simultaneous conception does not apply to AI-generated inventions because it is simply not true that AI machines merely assist in reduction to practice.[262] The lack of human intervention in DABUS's inventing process is the critical difference between unpredictable areas of chemistry and biology and is exactly what makes the doctrine inapplicable.[263]

Therefore, it may be true that AI-generated inventions are unpredictable like certain areas of biology and chemistry.[264] However, unlike the isolation or recognition of monoclonal antibodies,[265] no significant skills are required to appreciate AI-generated inventions.[266] Indeed, Professor Burk's analogy to monoclonal antibodies[267] may work in cases in which the AI machine only outputs unpredictable results but fails to recognize their novelty. However, it does not apply to AI machines like DABUS, which itself can recognize the novelty of its inventions.[268]

However, this Note does not contend that AI is capable of mentally conceiving an invention under current patent law. Even though AI has arguably mimicked the human brain,[269] courts agree that only natural persons are capable of achieving conception.[270] It is likely that courts will continue to take this view unless the line between natural persons and AI machines

262. Corrected Opening Brief for Plaintiff-Appellant Stephen Thaler, *supra* note 209, at 7 ("DABUS performed what is traditionally considered the mental part of the inventive act.").

263. *See* Schwein, *supra* note 138, at 598–600.

264. *See supra* Part II.A.

265. *See supra* Part II.A (analogizing the production of monoclonal antibodies by hybridomas to the generation of inventions by AI).

266. *See* Corrected Opening Brief for Plaintiff-Appellant Stephen Thaler, *supra* note 209, at 8 (stating that no significant skill is required to discern DABUS's inventions).

267. *See supra* notes 193–98.

268. *DABUS Described*, *supra* note 131.

269. Aaron M. Cohen, *Stephen Thaler's Imagination Machines*, THE FUTURIST (Aug. 2009), https://www.researchgate.net/profile/Stephen-Thaler/publication/299169623_Stephen_Thaler's_Imagination_Machines/links/5962d228aca2728c1119830b/Stephen-Thalers-Imagination-Machines.pdf [https://perma.cc/VT9Q-8P7J].

270. *See* Univ. of Utah v. Max-Planck-Gesellschaft zur Forderung der Wissenschaften E.V., 734 F.3d 1315, 1323 (Fed. Cir. 2013) (ruling that to perform the mental act of conception, inventors "must be natural persons"); *see also* Beech Aircraft Corp. v. EDO Corp., 990 F.2d 1237, 1248 (Fed. Cir. 1993).

blurs. After all, the inquiry that courts undertake to determine whether there is conception involves asking whether the entity is a natural person, and not asking how similar the entity functions to a human brain.[271]

Nonetheless, the fact that AI is incapable of mental conception of an invention does not necessarily mean that a natural person can still conceive of the same invention. Proponents of applying the doctrine of first to recognize and appreciate argue that because AI is incapable of appreciating the invention, the natural person who first appreciates the invention is the one that completes conception.[272] Cases like *Heard v. Burton* appear to support this position.[273] However, AI-generated inventions are distinguishable because the natural person recognizing the AI-generated invention is appreciating an invention created by the AI. This is an important distinction because case law does not say that appreciation alone is sufficient for conception.[274] Rather, it states that appreciation is a *necessary condition* of conception.[275] Therefore, merely appreciating an invention does not make one an inventor, as it is only one element of conception.[276]

More importantly, recognizing AI-generated inventions does not require any significant skills—any person having ordinary skill in the art would be able to recognize the invention.[277] This makes inventions generated by AI machines like DABUS more analogous to cases like *Spero v. Ringold*.[278] In *Spero*, the court faced an "anomalous situation" in which the inventor did not recognize a new compound configuration produced by his process.[279] However, the inventor's disclosure was sufficient enough that a person having ordinary skill in the art would have appreciated and recognized the new configuration.[280] There, the court held that the inventor had *inherently* conceived of the new configuration.[281] Emphasizing that conception is established when "the invention is made sufficiently to enable those skilled in the art to understand it,"[282] the court explained that the inventor achieved

271. *See* Thaler v. Vidal, 43 F.4th 1207, 1209 (Fed. Cir. 2022), *petition for cert. filed*, No. 22-919 (U.S. Mar. 21, 2023).

272. Schwein, *supra* note 138, at 580–81; Knutson, *supra* note 212, at 12, 22–24; *see also supra* Part II.B.

273. *See supra* note 229 and accompanying text.

274. *See* Invitrogen Corp. v. Clontech Lab'ys, Inc., 429 F.3d 1052, 1063 (Fed. Cir. 2005).

275. *Id.* (stating that there can be no conception without appreciation).

276. *See* Christian J. Garascia, Note, *Evidence of Conception in U.S. Patent Interference Practice: Proving Who Is the First and True Inventor*, 73 U. DET. MERCY L. REV. 717, 733, 735–48 (1996) (outlining the many components of a complete conception, which includes the completeness of the invention, the manifestation and corroboration of conception, and appreciation).

277. Corrected Opening Brief for Plaintiff-Appellant Stephen Thaler, *supra* note 209, at 8.

278. 377 F.2d 652 (C.C.P.A. 1967).

279. *Id.* at 655.

280. *Id.*

281. *Id.* at 660; *see also* Garascia, *supra* note 276, at 746 n.236.

282. *Spero*, 377 F.2d at 660 (emphasis omitted) (quoting Townsend v. Smith, 36 F.2d 292, 295 (C.C.P.A. 1929)).

conception through a sufficient disclosure despite not affirmatively recognizing the invention.[283]

Like the inventor in *Spero*, AI machines like DABUS might not be able to recognize or appreciate what they have created. However, they both generate inventive outputs that are sufficiently disclosed that a person having ordinary skill in the art would have recognized and appreciated the invention.[284] Because the inventor in *Spero* precluded follow-up contestants from claiming inventorship,[285] AI machines like DABUS should also preclude natural persons from inventorship when they merely recognize an AI-generated output that is obvious to those skilled in the art.[286] Even if AI machines are incapable of conception or appreciation, their disclosures are so detailed that it renders a natural person's appreciation meaningless. Therefore, the Conception Requirement that prevents AI machines from being named inventors also prevents, somewhat ironically, natural persons from claiming inventorship under the doctrine of first to appreciate. That is, AI machines cannot conceive the AI-generated invention because they are not natural persons;[287] natural persons also cannot conceive the AI-generated invention because there can be no conception if one merely appreciates an obvious disclosure.[288]

One may argue that *Spero*'s application is limited to pre-AIA cases, since AI machines do not apply for patents nor disclose their inventions to the public, so the natural person who appreciates the invention will never be barred from inventorship under the AIA as they will always be the first to file. However, although conception and priority are inherently related, they are separate issues. Even under the AIA, a person is not entitled to inventorship if they obtained the invention from another, regardless of whether the other person disclosed the invention to the public or applied for a patent.[289] AIA is a first-*inventor*-to-file, not a first-to-file system. Thus, even if the AI cannot apply for a patent, a natural person who subsequently obtains the invention from the AI should also be barred from inventorship if the disclosure displaces the person's ability to achieve conception in a meaningful way.

Moreover, as Professor Abbott notes, the first-to-appreciate doctrine does not necessarily reward the person that the patent system intends to incentivize.[290] The purpose of the patent system is "to foster and reward

---

283. *Id.*

284. *See* Corrected Opening Brief for Plaintiff-Appellant Stephen Thaler, *supra* note 209, at 8.

285. *See Spero*, 377 F.2d at 660.

286. *See* Schwartz & Rogers, *supra* note 170; *see also* Millamena, *supra* note 238, at 291 (arguing that the idea was already formed in the mind of the AI since the idea was so clearly defined that only ordinary skill would be necessary to reduce the invention to practice).

287. *See supra* notes 81–86 and accompanying text.

288. *See supra* notes 278–83 and accompanying text.

289. *See* 35 U.S.C. § 101 ("*Whoever* invents . . . may obtain a patent thereof . . . ." (emphasis added)); *see also* TUROSKI, *supra* note 42, § 2:14.

290. *See* Abbott, *supra* note 122, at 1104.

invention" and to promote the "disclosure of inventions."[291] If we award those who merely recognize the invention without significantly contributing to the creation of the invention, we might discourage those who actually put in the effort to invest in and use AI to generate inventions.[292] This also might encourage people to monitor the activity of others instead of utilizing their own AI machines.[293] Furthermore, determining who first recognized the invention would be costly and unpredictable.[294]

However, AI-generated inventions should not be placed in the public domain simply because current patent doctrines do not apply and there are no "inventors."[295] Doing so would completely abandon patent law as an incentive tool.[296] Although AI machines themselves do not require incentives to invent, the human agents associated with the AI that generates these inventions do.[297] Therefore, it is imperative to offer patent rights as incentives to encourage the generation of AI inventions. Indeed, AI-generated inventions would not provide any benefit to society without the natural person who recognizes and introduces the invention.[298]

This leaves us with a gap in patent law. On one hand, we hope to incentivize natural persons associated with AI to introduce more AI-generated inventions by granting patent rights. On the other hand, no current patent doctrine readily applies to allow patent rights to vest in those natural persons.

B. Repurposing Copyright Law's Work-For-Hire Doctrine

The ideal solution is to simply pretend that the natural person using the AI to generate the invention is the legal inventor of that invention.[299] There is

---

291. Aronson v. Quick Point Pencil Co., 440 U.S. 257, 262 (1979); 1 MOY, *supra* note 23, § 1:30; *see also* U.S. CONST. art. I, § 8, cl. 8.

292. *See* Dornis, *supra* note 250 (arguing that the first-to-recognize doctrine makes it hard to "grant rights to the actually deserving 'inventive' actor or actors"); *see also* Abbott, *supra* note 122, at 1104.

293. *See* 2 MOY, *supra* note 23, § 8:3.

294. *See* Dornis, *supra* note 250, at 124; Vertinsky, *supra* note 257, at 506.

295. Kovach, *supra* note 158, at 151.

296. *See id.* at 150.

297. *See* Atilla Kasap, *Copyright and Creative Artificial Intelligence (AI) Systems: A Twenty-First Century Approach to Authorship of AI-Generated Works in the United States*, 19 WAKE FOREST J. BUS. & INTELL. PROP. L. 335, 374 (2019).

298. Schwein, *supra* note 138, at 563.

299. *See* Robert A. McFarlane & Rosanna W. Gan, *Circuit Decision on AI Complicates Inventor Strategies*, BLOOMBERG L. (Sept. 14, 2022, 4:01 AM), https://news.bloomberglaw.com/in-house-counsel/circuit-decision-on-ai-complicates-inventor-strategies [https://perma.cc/9GJU-26RE] ("Congress or the Supreme Court could fill the *Thaler*-sized hole in inventorship eligibility by amending or interpreting the patent statutes to recognize that a natural person controlling, programming, or providing input to an AI is considered the 'inventor' for the purposes of applying for patent protection on inventions potentially 'conceived' by AI."); *see also* Yuan Hao, The Rise of "Centaur" Inventors: How Patent Law Should Adapt to the Challenge to Inventorship Doctrine by Human-AI Inventing Synergies 102 (Aug. 10, 2022) (unpublished manuscript), https://ssrn.com/abstract=4186684 [https://perma.cc/2UED-S4LD] (proposing a similar solution in which humans can "constructively conceive" an invention generated by AI machines if certain elements are met).

no need to act as if current patent doctrines and the Conception Requirement are applicable to AI-generated inventions when they clearly are not.[300] Instead, Congress should simply eliminate the Conception Requirement for AI-generated inventions.

It would not be the first time that Congress carved out such an exception under intellectual property law.[301] Under copyright law, title vests initially in the author of the work,[302] i.e., the person who is the originator or the maker of the work.[303] However, as introduced in Part I.B.3, in cases of copyrighted works made for hire, "the employer or other person for whom the work was prepared is considered the author."[304] Congress carved out this exception for authors and has effectively recognized that the person who expended the mental work is not necessarily the "author."[305] Congress could do the same for AI-generated inventions.[306]

AI-generated inventions and works made for hire are highly analogous. Like natural persons that operate the AI to generate inventions, commissioners ordering copyrightable works are not involved in the mental creation of the works.[307] Yet copyright law still treats commissioners of the work as the author of the work and vests title in them.[308]

The role of AI operators in AI-generated inventions and that of commissioners in works made for hire are also similar. Commissioners often contribute to the process of the work by offering resources and outlining general goals.[309] Similarly, AI operators provide power and data to AI machines and order them to create inventions.

There are several benefits in repurposing the work-for-hire doctrine and recognizing the natural person using the AI to generate inventions as the legal inventor of those inventions. First, this solution provides certainty. Courts would not need to wade through opaque factual determinations of whether a particular algorithm displaced a natural person's capability to achieve conception.[310] A bright-line rule ensures that all AI-generated inventions are patentable. The natural person using the AI can also confidently list themselves as inventors without worrying about inventorship misrepresentation. Moreover, this solution ensures that inventorship is

300. *See supra* Part III.A.

301. *See infra* notes 302–05 and accompanying text.

302. *See* 17 U.S.C. § 201(a).

303. *See* Burrow-Giles Lithographic Co. v. Sarony, 111 U.S. 53, 57–58 (1884) ("An author in that sense is 'he to whom anything owes its origin; originator; maker; one who completes a work of science or literature.'"); 1 HOWARD B. ABRAMS & TYLER T. OCHOA, THE LAW OF COPYRIGHT § 4:1 (2022).

304. 17 U.S.C. § 201(b); *see also* Est. of Burne Hogarth v. Edgar Rice Burroughs, Inc., 342 F.3d 149 (2d Cir. 2003).

305. *See* 17 U.S.C. § 201(b).

306. This Note recommends adopting the work-for-hire doctrine only as applied to AI-generated invention, not the concept as a whole.

307. *See* 3 MOY, *supra* note 23, § 10:16.

308. *See* 17 U.S.C. § 201(b).

309. *See* 3 MOY, *supra* note 23, § 10:17.

310. *See* Knutson, *supra* note 212, at 26.

vested in the person that the patent system intends to incentivize.[311] Awarding patent rights to the person who orders the creation of the invention incentivizes people to initiate the creation of AI-generated inventions. It also circumvents the concern raised by critics about awarding inventorship to someone who only appreciates the invention without having taken part in the inventing process.[312]

Second, the certainty of patentability facilitates the goals of the patent system. If applicants are confident that AI-generated inventions are patentable, they will apply for patents. This will, in turn, disclose their inventions to the public, thereby fulfilling the patent system's goal of promoting the progress of science and the arts.[313]

Third, certainty also lowers social costs. If natural persons are certain that inventorship will vest in those using the AI, suits disputing who is the one actor that recognized the invention under the first-to-appreciate doctrine could be avoided.[314] Moreover, people would not spend time monitoring others' activities in lieu of utilizing their own AI machines.[315]

Fourth, the solution also promotes candor. Applicants would be willing to faithfully disclose how their inventions were created as they would not worry about losing their patent rights if they disclosed that AI machines generated their inventions.[316] Moreover, courts would also be transparent about their reasoning. Under current patent law, courts would need to bend over backwards to justify awarding inventorship to a natural person for an AI-generated invention.[317] This solution would spare courts from exaggerating the significance of the human's appreciation or their mental act when their contribution to the AI-generated invention is questionable.[318] Further, this solution would also prevent courts from finding that mere appreciation is sufficient for conception and thus inventorship—a slippery slope that would erode long-standing legal principles regarding conception.[319]

Lastly, awarding inventorship to the person who commissions the invention would circumvent issues such as whether AI machines are capable of conception[320] or how close AI machines are to replicating the function or anatomy of a human brain.[321] These metaphysical questions are probably best left untouched by courts.[322]

---

311. *See* Abbott, *supra* note 122, at 1104.
312. *See* Dornis, *supra* note 250; Abbott, *supra* note 122, at 1104.
313. *See supra* notes 18–19 and accompanying text.
314. *See* Dornis, *supra* note 250; Vertinsky, *supra* note 257, at 506.
315. *See supra* note 256 and accompanying text; 2 MOY, *supra* note 23, § 8:3.
316. *See* Kovach, *supra* note 158, at 150.
317. *See supra* Part III.A.
318. *See* Schwartz & Rogers, *supra* note 170.
319. *See supra* Part III.B.
320. *See* Thaler v. Vidal, 43 F.4th 1207, 1209 (Fed. Cir. 2022), *petition for cert. filed*, No. 22-919 (U.S. Mar. 21, 2023).
321. *See* Knutson, *supra* note 212, at 11.
322. The court in *Thaler* did not seem too eager to discuss these "metaphysical questions." *See* 43 F.4th at 1209.

One may argue that awarding inventorship to the person using the AI-generated invention is unfair to other inventors as they have not expended the same mental effort as conventional inventors. However, there is no "sweat of the brow" rule in patent law.[323] Neither does patent law take the value of an invention into account. So long as the invention fulfills the patentability requirements, the patent term awarded is twenty years, regardless of the invention's value.[324] However, should Congress choose to take the difference in mental effort into account, it can adjust the patent term for AI-generated inventions as it did for works made for hire under copyright law.[325]

It could also be argued that such a drastic change in the law is unnecessary since courts can simply assign inventorship by treating the AI machine as an extension of the person who owns or controls it. By doing so, the human supplements the AI machine's inability to satisfy the mental requirement, while the AI machine supplements the human's limited input of ideas and appreciation.

However, this arrangement would likely lead to a slippery slope and the erosion of the Conception Requirement. Doing so broadens the scope of the first-to-appreciate doctrine by not only awarding inventorship to natural persons appreciating their own inventions, but also to those that appreciate inventions not created by themselves. It would also force courts to answer philosophical questions that they prefer not to discuss.[326] Therefore, stretching the doctrine of first to recognize and appreciate may only serve as a short-term solution for AI-generated inventions, especially when there is still disagreement over how much the natural person has contributed to an AI-generated invention. However, as AI systems inevitably become more sophisticated, and their reliance on humans decreases, a clear and bright-line rule for establishing natural person inventorship and patent ownership of AI-generated inventions is needed.

Professor Abbott takes this position a step further and argues that the mental requirement of conception should be eliminated entirely because "the patent system should be indifferent to the means by which invention comes about."[327] He argues that the elimination of the mental requirement follows logically from the abolishment of the "flash of genius" doctrine.[328] However, the mental requirement is still workable for other inventions.[329] Congress abolished the flash of genius doctrine because it tied the patentability of all inventions to a vague mental process.[330] Here, only one type of invention is

323. *See* Burk, *supra* note 170, at 307.

324. *See* 35 U.S.C. § 154(a)(2).

325. *See* 17 U.S.C. § 302(c); Cmty. for Creative Non-Violence v. Reid, 490 U.S. 730, 737 (1989).

326. *See, e.g.*, *Thaler*, 43 F.4th at 1209 (relying solely on statutory definition to decide whether AI can be listed as an inventor, without mentioning conception or "ponder[ing] . . . metaphysical matters" such as "the nature of invention or the rights, if any, of AI systems").

327. Abbott, *supra* note 122, at 1110.

328. *See id.*; *see also supra* note 72 and accompanying text.

329. *See* Knutson, *supra* note 212, at 15 n.79.

330. *See supra* note 72 and accompanying text.

unworkable under the Conception Requirement: AI-generated inventions. One type of invention does not warrant eliminating the entire Conception Requirement.

For the reasons above, Congress should repurpose copyright law's work-for-hire doctrine and recognize the natural person who uses the AI-generated inventions as their legal inventor. Doing so would bridge the inventorship gap in AI-generated inventions, offer certainty as to their patentability, and facilitate the goals of the patent system.

CONCLUSION

As technology advances, AI's contribution to inventorship will inevitably increase.[331] Although the patent system may be flexible, it is not equipped to deal with AI-generated inventions. This Note argues that there is an inventorship gap in AI-generated inventions. On one hand, the Conception Requirement and Natural Person Requirement bar AI from becoming inventors; on the other hand, the definition of conception prevents natural persons from becoming the legal inventors of AI-generated inventions due to their limited input of recognition and appreciation, thereby leaving AI-generated inventions "inventor-less" and thus unpatentable.

To bridge this inventorship gap, Congress should repurpose the work-for-hire doctrine from copyright law and recognize the natural person who commissions the AI-generated inventions as the legal inventor. Doing so would not only offer certainty as to the patentability of AI-generated inventions, but also facilitate the goals of the patent system.

331. *See* Dirk Knemeyer & Jonathan Follett, *Could Machines Become Creative?*, TOWARDS DATA SCI. (June 13, 2019), https://towardsdatascience.com/could-machines-become-creative-49f346dcd3a3 [https://perma.cc/3AEU-XME7].